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SANTA ROSA MOUNTAINS WILDLIFE HABITAT MANAGEMENT PLAN

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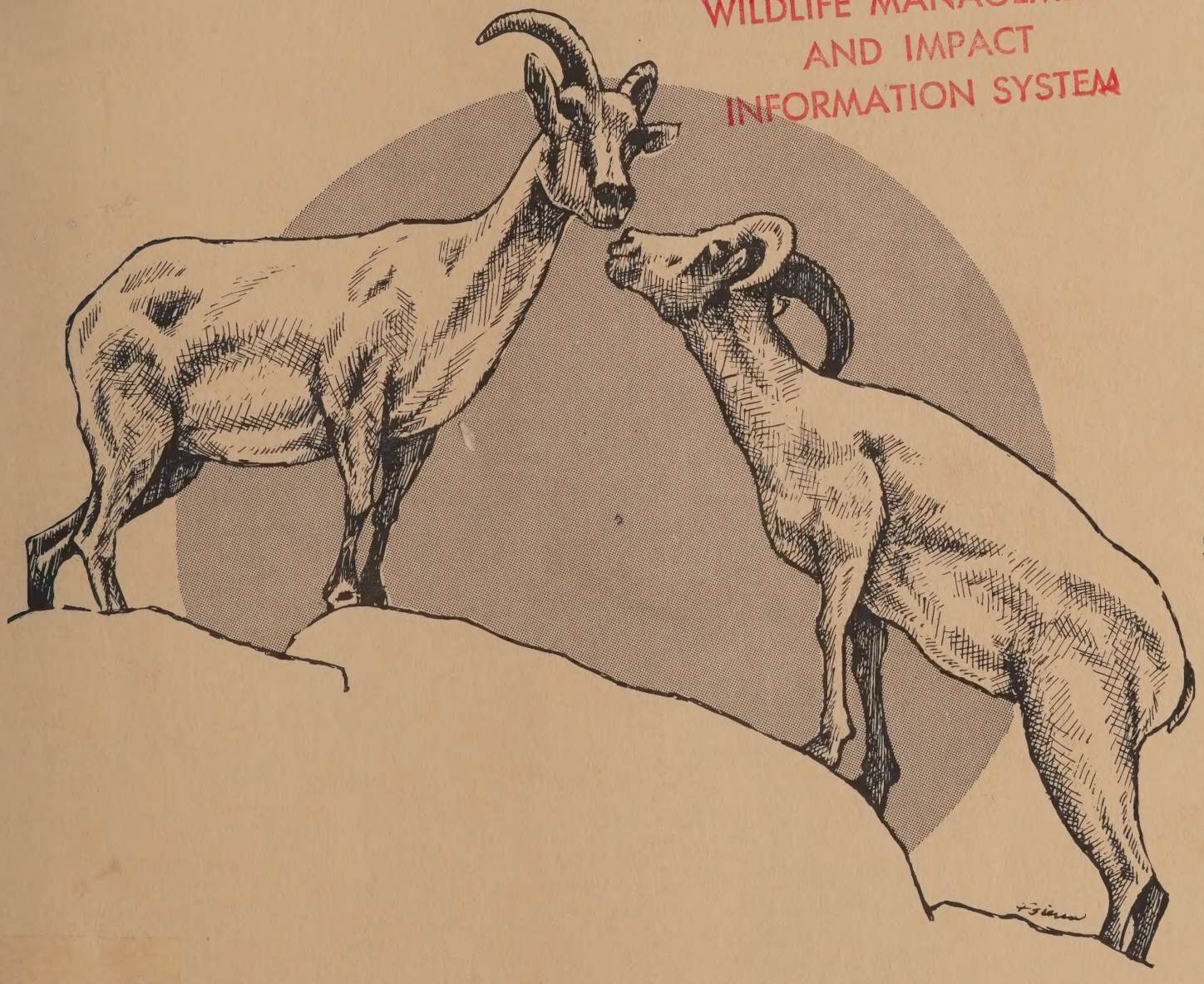

prepared by:

U.S. Dept. of the Interior
Bureau of Land Management
Palm Springs District
Santa Rosa Resource Area

and

State of California
Resources Agency
Dept. of Fish and Game

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SANTA ROSA MOUNTAINS
WILDLIFE HABITAT MANAGEMENT PLAN
FINAL

A Sikes Act Project

Prepared by:

Department of the Interior
Bureau of Land Management
Riverside District Office
Indio Resource Area

State of California
Resources Agency
Department of Fish and Game

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SANTA ROSA MOUNTAINS HABITAT MANAGEMENT PLAN

Final Approval

The Santa Rosa Mountains Habitat Management Plan was developed and will be implemented under the Sikes Act of October 18, 1974. (PL 93-452).

U.S. Department of the Interior
Bureau of Land Management
Riverside District Office

Bruce Ottenfeld 9/3/80
Gerald E. Hillier Date
District Manager

State of California
The Resources Agency
Department of Fish & Game

Fred A. Worthley, Jr. 9/16/80
Fred A. Worthley, Jr. Date
Regional Manager
Region 5

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I. INTRODUCTION

A. GENERAL

This report defines the Wildlife Habitat Management Plan (HMP) for the area to be designated as the Santa Rosa Mountains Wildlife Habitat Area (WHA) and formulates a set of management guidelines by which the area will be managed for the preservation of the wildlife resources and their habitats (see Map 1). The plan was prepared by the Indio Resource Area, Riverside District, Bureau of Land Management (BLM), and the California Department of Fish and Game (CDF&G) under the authority of the Sikes Act.

The Santa Rosa Mountains support the largest population of Peninsular bighorn sheep (Ovis canadensis cremnobates) in the United States. This bighorn sheep population has one of the highest densities in the California desert (Weaver and Mensch, 1970). However, the range of this subspecies is limited. The threat of habitat reduction, due to development and human encroachment, prompted the listing of the Peninsular bighorn sheep as rare by the California Fish and Game Commission in January, 1972.

The proximity of the Santa Rosa Mountains to a thriving urban center, the Coachella Valley, increases not only the value of the mountains as a public resource but also their vulnerability. Prior to 1960, the WHA was disturbed little by human encroachment; however, the last two decades have seen a marked increase in subdivision and land development. Bighorn sheep habitat has been and is shrinking due to the expansion of cities along Highway 111 and the increase in residential development along Highway 74. This compounded by the checkerboard land ownership pattern of the WHA makes an effectual management plan essential if the preservation of bighorn sheep habitat and other wildlife values is to be insured.

The principal emphasis of the plan will be the management of this population of Peninsular bighorn sheep. A basic premise is that a viable bighorn sheep population will not be maintained unless the essentially pristine character of the habitat is preserved. If the WHA is to retain its relatively undisturbed character, public use must be tailored to insure minimal permanent impacts. The intent of the plan is to provide for public use of the area in a manner consistent with the maintenance of the existing wildlife values. The management of bighorn sheep habitat will provide necessary protection for numerous other wildlife resources, including three species listed by the state of California and/or federal government and three others receiving special management concern (i.e. BLM sensitive and Audubon Society's Blue List).

The U.S. Forest Service (USFS) supports the HMP in its general concept to manage for the preservation of Peninsular bighorn sheep. The portion of the San Bernardino National Forest adjacent to BLM administered land and supporting bighorn sheep has been included within the WHA boundary.

However, USFS lands **will** not be covered by either the planned actions or the management guidelines proposed in the plan until such time as the Forest Land and Resource Management Plan is complete in 1982-83. At that time, the HMP will be amended and USFS management decisions incorporated.

The Santa Rosa WHA has not been covered by a Management Framework Plan or Unit Resource Analysis under the BLM planning system. The area is within the California Desert Conservation Area and is covered in a broad manner by the Desert Plan.

B. PHYSICAL FEATURES

1. LOCATION AND LAND STATUS

The Santa Rosa Mountains are located south of Palm Springs and west of Indio and the Salton Sea in Riverside County, California. The WHA encompasses approximately 306 square miles and all or portions of the following townships:

T. 4 S., R. 4, 5 E.
T. 5 S., R. 4, 5, 6, 7 E.
T. 6 S., R. 4, 5, 6, 7 E.
T. 7 S., R. 5, 6, 7, 8 E.
T. 8 S., R. 5, 6, 7, 8 E.

It is bordered by the San Bernardino National Forest to the west, Anza-Borrego State Park to the south and the Agua Caliente Indian Reservation to the northwest (see Map 1).

The only major access through the area is State Highway 74, the Palms to Pines Scenic Highway, originating in Palm Desert.

Land ownership within the WHA is diverse. Outside of the Forest boundary, most of the even sections are administered by the BLM, odd sections are generally privately owned or managed by the CDF&G or the University of California (See Map 2).

Land ownership:

Bureau of Land Management	121.5 mi^2
California Department of Fish and Game	40.0 mi^2
San Bernardino National Forest	15.0 mi^2
University of California	8.6 mi^2
Agua Caliente Indians	3.0 mi^2
Private	118.0 mi^2
TOTAL	306.1 mi^2

2. TOPOGRAPHY

Elevation within the WHA varies from just below sea level to 7,726 feet along the Santa Rosa ridge. The topography is varied within these elevation extremes. The lowest elevations, which are in the Coachella Valley, are generally flat sandy washes which graduate into steep, rugged canyons to approximately 3,500 feet. Above this elevation the topography opens onto slopes with a combination of chaparral and pinyon pine associations.

3. CLIMATE

The WHA is characterized by hot days and warm nights during the summer months and mild temperatures during the winter. Summer highs regularly exceed 100° F., with July consistently being the hottest month. December and January are the coldest months. Temperatures during these months vary considerably with elevation. The number of freezing days per year increases from almost none at the low elevations to an average of 60 at the Pinyon gauge station at 4,000 feet.

Much of the WHA falls within the rainshadow of the San Jacinto Mountains. The precipitation is relatively low and erratic. The 14-year average at the Philip L. Boyd Deep Canyon Research Station (located within the WHA at 950-foot elevation) is 3.65 inches per year, yet the 5-year annual average from 1974-1979 is 7.5 inches per year. Winter rainfall accounts for approximately two-thirds of the annual precipitation; however, in some years late summer storms also add considerably to the annual precipitation. Snowfall can be expected in the higher elevations.

The following data, as well as the above information was collected by the University of California staff at the Philip L. Boyd Deep Canyon Desert Research Center.

Deep Canyon Research Station

Elevation - 950 ft.
14-year average

July

102° F. - average maximum temperature
80° F. - average minimum temperature

December/January

64° F. - average maximum temperature
49° F. - average minimum temperature

Pinyon Station

Elevation - 4,000 ft.
Annual average 1978

July

91° F. - average maximum temperature
64° F. - average minimum temperature

December

49° F. - average maximum temperature
28° F. - average minimum temperature

C. PAST AND PRESENT MANAGEMENT

The management of the majority of the WHA involves the BLM, CDF&G, San Bernardino National Forest, University of California, and the City of Palm Springs. The following list of designations and management actions represents significant past and present management decisions within the WHA. The Existing Management Map (Map 3) illustrates those designations which have or are capable of having significant impact on the implementation of the HMP.

Bureau of Land Management

Dead Indian Creek Natural Area - 960 acres described as

T. 6 S., R. 5 E., SBM
Section 2, NW 1/4 SW 1/4, S 1/2 SW 1/4, S 1/2 SE 1/4
Section 10, E 1/2, N 1/2 NW 1/4
Section 12, N 1/2 NE 1/4, NW 1/4, N 1/2 SW 1/4, SW 1/4 SW 1/4

The Dead Indian Creek Natural Area was established for the protection of a grove of California fan palms and bighorn habitat. The area was withdrawn under Public Land Order (PLO) 5224 mineral entry, agricultural entry, and public scale.

Wilderness Study Area #341 - see Map 3 for location

In cooperation with CDF&G, the area of contiguous BLM and CDF&G administered land covering much of the southern half of the WHA has been designated a Wilderness Study Area (WSA). The WSA is expected to be recommended in the Desert Plan for final Wilderness designation. This recommendation will be forwarded through the Secretary of the Interior and the President to the Congress. The decision for final designation will be made by Congress.

Vehicle Use Designation - entire WHA

The BLM Interim Critical Management Plan classifies the Santa Rosa Mountains as "Designated Roads and Trails". The roads in this area have not been evaluated or designated by the Bureau. Until this is accomplished, vehicle travel is limited to existing roads and trails.

Scheffer Grazing Allotment - 2,240 acres (1,280 acres with WHA) described as:

T. 8 S., R. 5 E., SBM

Sections 2, 4, N 1/2 8, 10

The lessee must comply with all standard grazing laws and terms. In addition, the lessee is responsible for restricting livestock to the designated areas at the designated season and must provide water for livestock as necessary to accomplish livestock distribution as described in the lease.

Current Mining Claims

T. 7 S., R. S E., SBM

Doris Jean		Section 12	Bema Corporation

T. 7 S., R. 6 E., SBM

Red Devil	#27-30	Section 28	Kevin, Carroll H. Devin, Kenneth J. Michael, Almon O.

T. 8 S., R. 7 E., SBM

Flick and Martin Co.	#3	Section 15	Flick, Tom J. Martin, Walter

This claim had been recorded by the County of Riverside in 1980; however, has not been recorded with the BLM. The claim is on public land.

California Department of Fish and Game

State Game Refuge - 4-D - See Map 3 for Location

This game refuge was established by the state legislature in 1917 primarily for the protection of bighorn sheep. The refuge boundary was enlarged in 1967 to encompass more bighorn habitat. It is illegal to take or possess any bird, mammal, or reptile or to be in possession of firearms, bow and arrows, etc., within the refuge.

Bighorn Sheep Field Work - entire WHA

The first CDF&G bighorn survey was made in the Santa Rosa Mountains in 1953 (Jones, Flittner, and Gard, 1957). Bighorn habitat utilization surveys were begun in 1957 (Blong and Pollard, 1968). In 1958, the Department began conducting bighorn water hole counts; these were conducted annually until 1968. In 1970, triannual water hole counts were initiated. In 1976, helicopter herd-composition counts were begun in the spring and fall.

State Wildlife Conservation Board Acquisitions

In 1972, the California Fish and Game Commission declared the Peninsular bighorn sheep a rare species. Subsequent to the rare listing, the State Wildlife Conservation Board, working with the Heritage Conservation and Recreation Service, has endeavored to consolidate critical bighorn habitat in the Santa Rosa Mountains. To date, this effort has consolidated 40 mi^2 of bighorn habitat under state ownership.

Carrizo Canyon Ecological Reserve - described as

T. 6 S., R. 5 E., SBM
Section 13 all except 120 acres
Section 24 E 1/2 E 1/2

T. 6 S., R. 6 E., SBM
Section 7 west of Highway 74
Section 19 S 1/2 west of Highway 74

Magnesia Canyon Ecological Reserve - described as

T. 5 S., R. 5 E., SBM
Section 14, portion of S 1/2 S 1/2

The California Fish and Game Commission established the above ecological reserves primarily to preserve vital bighorn water sources subject to heavy public use. Management plans have been prepared by CDF&G for these ecological reserves. Copies are available through the California Department of Fish and Game.

Desert Slender Salamander Ecological Reserve

Land description withheld.

The California Fish and Game Commission established an ecological reserve to preserve and protect the habitat of the desert slender salamander. The 54.4 ha (134.5 acres) reserve represents the only known habitat of this endangered (state and federal) salamander.

San Bernardino National Forest

Habitat Management Plan - approximately 25 mi^2 of the WHA is administered by the Forest Service.

A management plan which covers this portion of the WHA has been prepared by the Forest Service. The plan was developed in 1963 and deals largely with land acquisition and water development to benefit bighorn sheep. Land acquisition in the area is nearly complete. A copy of the plan is available through the San Bernardino National Forest.

Rare II

Further Planning Area A5188 - see Map 3 for location

Further planning areas will remain essentially undeveloped until the Forest Land and Resource Management Plan is completed in 1982-83. Designation of these areas to the National Wilderness System will require Congressional approval.

Area B5188 (Map 3) was designated non-wilderness by the Forest Service. This area is available for multiple use activities other than wilderness.

Wellman Grazing Allotment

The Wellman allotment contains approximately 17,000 acres of National Forest land and 6,225 acres of private land. Approximately 1,600 acres of the allotment are within the WHA boundary (see Map 3).

University of California

Philip L. Boyd Deep Canyon Desert Research Center

Lands owned by University of California - 8.6 mi^2 (5536 acres)

T. 6 S., R. 6 E., SBM (See Map 2)
Section 8 all
" 9 all
" 15 all
" 16 all
" 17 all
" 19 approximately E 1/2
" 20 all
" 21 all
" 27 all

T. 5 E., R. 6 E., SBM

Section 34 approximately N 1/2

BLM lands under use agreement with the University of California - 16 mi^2 (10,280 acres).

T. 6 S., R. 5 E., SBM
Section 36, N 1/2 NE 1/4, SE 1/4 NE 1/4, SE 1/8 NW 1/4

T. 6 S., R. 6 E., SBM
Section 2; Lots 1,2,3, and 4; S 1/2 N 1/2, S 1/2
" 4; Lots 1 and 2, S 1/2 NE 1/4, S 1/2
" 6; Lots 6 and 7, E 1/2 SW 1/4 SE 1/4
" 10
" 14
" 18; Lots 1,2,3, and 4, NE 1/4, E 1/2 NW 1/4 SE 1/4 SW 1/4, SE 1/4
" 22
" 26
" 28
" 30; Lots 3 and 4, E 1/2, E 1/2 SW 1/4
" 32
" 34
" 36

T. 7 S., R. 6 E.
Section 2

The Philip L. Boyd Deep Canyon Research Center is one of 26 reserves in the University's Natural Land and Water Reserves system. Established in 1959, the reserve provides for research and educational use by all types of institutions of higher learning and has become one of the most active desert research stations in the world.

In April 1966, the BLM and University of California signed a basic cooperative agreement. The cooperative agreement was amended in May 1971, and June 1972, to cover a total of 10,280 acres around a core of University owned land in the Deep Canyon. Its primary purpose is the use of public lands for the study of desert biology and ecology and the exchange of resulting information. This agreement is in force and will continue indefinitely until terminated by one or both parties.

City of Palm Springs

Palm Hills - See Map 3 for location

The City of Palm Springs in July 1970, annexed 34 square miles in the Santa Rosa and San Jacinto Mountains. The annexed area generally includes a three to four mile wide swath from the city center to just south of Asbestos Mountain. In 1972, a General Plan was written for the area (Palm Hills). Representatives from the BLM and CDF&G were among many parties involved in a study committee on the Palm Hills General Plan. One of the basic assumptions of the plan was that the BLM land in the Palm Hills area (approximately 13 mi^2) would be available for exchange to consolidate private land for development.

Due to laws enacted after 1972, including the Federal Land Policy Management Act, 1976, and increased knowledge of this herd of Peninsular bighorn sheep that assumption is no longer valid. This HMP calls for the retention of public lands within the area and wherever possible exchange with interested persons for private land within the WHA for BLM lands outside of the WHA.

D. BIOLOGICAL FEATURES

1. WILDLIFE

a. PENINSULAR BIGHORN SHEEP

Status

The Peninsular bighorn sheep is identified on the California Fish and Game's list of rare species (CDF&G, 1972). Bighorn sheep have been fully protected in California since 1873.

Distribution

The Peninsular race is found from the San Jacinto Mountains south through the Santa Rosa Mountains and throughout most of the mountain ranges in the Anza-Borrego Desert State Park south to the Sierra San Pedro Martir Mountain range in northern Baja California, Mexico (Buechner, 1960). Bighorn within the WHA presently occupy an area from Palm Canyon south to the Riverside County line (Map 4). They are found on the western slope of the Santa Rosa Mountains within the WHA from Rabbit Peak north to Upper Rockhouse Basin including Buck Ridge. Distribution in the Santa Rosa and San Jacinto Mountains does extend outside of the WHA. However, these areas are administered by National Forest Service[1], Agua Caliente Indians and California State Parks and Recreation, and have therefore not been included within the WHA.

Bighorn Habitat Classifications (See Map 4)

The Bighorn Sheep Distribution Map (Map 4) illustrates the bighorn sheep range in the Santa Rosa Mountains. Bighorn habitat is divided into four habitat classifications modeled after Hansen's habitat classification system; it recognizes that different areas within the sheep range have differing significance relative to the maintenance of the sheep population. Classifications of the habitat are based on the following factors: bighorn utilization and preference, terrain characteristics, vegetation, proximity to urban areas, sensitivity to disturbance, and importance to bighorn sex and age classes.

---

1 Bighorn habitat within the San Bernardino National Forest in the Santa Rosa Mountains has been included within the WHA. Bighorn habitat within the San Bernardino National Forest Service in the San Jacinto Mountains has not been included due to a lack of BLM administered land.

Vital to Bighorn Sheep: This category includes those areas in which bighorn concentrate during hot, dry periods and includes lambing areas and permanent water sources that provide essential habitat components without which the bighorn could not survive.

Primary Importance: These lands are used by bighorn primarily outside the hot, dry period and include major crossings, canyon bottoms, benches, and flats in rough mountainous terrains characteristically associated with consistent bighorn use.

Secondary Importance: Lands that fall within this category receive periodic use by bighorn or are considered necessary to maintain a viable population. This rating may include terrain which is not characteristically associated with high bighorn use, but provides important habitat for rams or receives periodic use by ewes and young bighorn.

Zone of Deficiency: Lands that fall within this rating currently receive irregular use by bighorn. This category includes those lands most prone to human impacts and areas lacking habitat components considered necessary for bighorn. These lands may be improved for bighorn use through habitat manipulation (water development) or by a change in the human use pattern.

The intent of the habitat classification system and map is to provide a basis for management decisions. The measure of bighorn habitat importance implied by the different classifications should not be interpreted solely as a function of bighorn habitual use intensity. Primary, secondary, and deficient areas to bighorn should not be considered of less importance than vital areas. Each acre of bighorn habitat is important in maintaining the present population. Used in conjunction with the seasonal distribution patterns of bighorn, the classifications call attention to habitat values and point out potential impacts or conflicts.

Habitat Requirements

Bighorn sheep in the Santa Rosa Mountains exhibit a seasonal pattern of distribution. The primary factors affecting the pattern of movement are forage and water availability.

During the winter-spring period (October-May), bighorn are distributed widely over the available range. Forage and water conditions at this time are generally optimum. A separation of sex and age classes is exhibited during this period. Ewes, lambs, and young rams are often found together. Mature rams exhibit greater mobility and are wider ranging.

During the summer-fall period (May-October), all bighorn are dependent on the permanent sources of water (Turner, 1973) and are more restricted in distribution (Blong and Pollard, 1968). During this period, diminishin water sources and breeding activities (July-November) combine to aggregate the population.

Summer concentration areas are associated primarily with dependable water sources and ideally provide a diversity of vegetation to meet the forage requirement of bighorn. Precipitous slopes (greater than 50 percent) are associated with these areas and provide escape terrain within 30 yards of the water source.

Bighorn use of summer concentration areas is greatest from July through October. Water requirements are generally more stringent from August to October when breeding activities are at a peak and springs produce less water. Habitat requirements were evaluated for summer concentration areas, lambing areas, and key portions of the primary habitats from 1977 to 1979 by the California Fish and Game Department. A study of bighorn activity in a summer concentration area of the Santa Rosa Mountains by Blong and Pollard (1968) demonstrated that ewes, lambs, and young sheep remained within 0.75 miles (0.45 km) of water holes during July and August. Mature rams, which began to concentrate at waterholes in August, were observed to travel at least 3 miles (1.8 km) from water, to drink less frequently than other sheep, and to remain nearer the water holes during the breeding season. After summer rains, bighorn dispersed from summer concentration areas for brief periods.

The lambing period is from January-June with most lambs being born between February and May. The need for dependable water sources for lactating ewes and growing lambs results in the majority of lambing areas being tied to summer concentration areas (Map 4). Lambing areas observed within the Santa Rosa Mountains have been associated with a ridge, bench, or canyon rim adjacent to precipitous slopes or escarpments. The steep terrains (slopes 45-85 percent) provide a diversity of slopes and exposures for escape and thermal cover. The proximity to dependable water sources and precipitous terrains are recognized as dominant characteristics of lambing areas.

Bighorn disperse from the summer concentration areas when the dry season is broken or temperatures moderate. Preferred areas within the primary habitats generally contain numerous ridges having at least 150 feet of steep slopes (> 50 percent) cut by many gullies. Gullies and side washes are at various angles providing a diversity of slope aspect. Prominent rock outcrops enhance the topography criteria. Bighorn stay within 250 yards of steep terrain (> 40-60%) but also utilize flats, benches, and canyon bottoms. Optimum forage areas have a diversity of plant associations with a minimum of 5% of the ground cover being grass and 15 species of shrubs. Visibility for bighorn should not be restricted by the vegetation.

Bighorn Water Requirements

Water quantity and distribution are recognized as important limiting factors for desert bighorn (Turner, 1973). Table 1 provides documentation of important water sources. The physiology of the water requirements of bighorn in the Santa Rosa Mountains was examined by Turner (1973). Turner reported that bighorn did not use water holes during the period from December-May but derived required water from their diet. During the dry period, however, bighorn are unable to meet their evaporative body losses with water derived from their diet and must rely upon water holes to supply the difference in their total water requirement. This point was illustrated further by Turner in a hypothetical bighorn water balance budget based on the observed reponses of corralled bighorn over a 5-day period. The budget indicates that a 50-kilogram (110-lb) hypothetical bighorn requires a minimum of 1.4 liters (1.5 qts) of free water per day to maintain water balance during midsummer conditions. The water requirements for free-ranging bighorn are expected to be greater.

During August of 1974, Department of Fish and Game personnel monitored the flow of Carizzo Spring, an important water source in the Santa Rosa Mountains. A flow of 2.5 liters (0.66 gal) per hour was recorded which provided a daily production of 60 liters (16 gal) of water (Blong, California Dept. Fish & Game, pers. comm.).

Combining this information with Turner's midsummer minimum daily water requirement of bighorn indicates that Carrizo Spring would fulfill the daily water requirements for no more than 42 bighorn. Richard Weaver has evaluated this question for the CDF&G. Weaver's formula for an adequate water supply is 1 gallon of water per bighorn per day for 100 hot days during the dry period. The formula provides a method for determining an adequate water supply for bighorn during a summer period. This illustrates the importance of water as a limiting factor for bighorn, and the necessity of maintaining maximum flow and retention of available water during dry periods. Optimum water distribution calls for a dependable water source at two mile intervals (Map 5).

Table 1. California Department of Fish and Game
Bighorn Water Hole Counts in the Santa Rosa Mountains (number of individuals)

Water Source	1958	1959	1961	1962	1963	1964	1965	1966	1968	1970	1973	1976
Thunderbird	--	--	--	--	--	--	19	27	--	--	23	28
Magnesia	4	--	6	--	--	--	--	--	7	--	--	13
*Carrizo	25	12	11	27	17	14	30	4	50	28	13	24
Aqua Alta	--	--	--	9	4	--	--	5	--	--	2	--
Tahquitz	7	8	12	10	3	12	19	24	20	28	40	12
Boulder	--	2	6	12	8	14	20	22	12	2	19	6
S.F. Martinez	12	5	18	31	23	17	19	1	8	21	4	32
Sumac	17	3	13	6	4	9	68	22	13	26	6	33
Cottonwood	18	6	1	5	35	22	13	3	2	27	12	4
Middle Willows	--	--	--	--	--	--	45	--	--	28	56	33
Guadalupe Canyon	9	--	--	--	--	--	--	--	--	--	2	--
Rattlesnake	--	16	28	31	14	25	30	--	--	21	40	6
Deep Canyon	--	--	--	--	--	--	--	--	--	--	52	--
Other	--	11	11	--	--	--	--	--	--	40	3	14
TOTALS	92	63	106	131	108	113	263	108	112	221	272	205

* Two springs counted some years.

Population Status and Trend

According to the CDF&G, the sex ratio for adult bighorn is generally 100 rams to 100 ewes. Summer water hole counts held since 1958 and recent spring and fall herd composition counts have shown that this bighorn population has not had a major decrease in number in the past 21 years. Normal fluctuations involving primarily the recruitment of young into the population have been frequent. Bighorn populations are never static but fluctuate between periods of good and poor lamb survival (see Table 2 and 3).

Average ratios of 35 lambs and 15 yearlings per 100 ewes were determined by the summer water hole counts held from 1948 to 1961 on the Nevada Desert Game Range (Hansen, 1967). Hansen demonstrated that the population on the Game Range increased when the average yearling ratio was greater than 15 yearlings per 100 ewes. McQuivey (1978) demonstrated that a fall ratio of 26 lambs per 100 ewes is the absolute minimum ratio required to maintain a stable population. An average ratio of 35 lambs and 16 yearlings per 100 ewes resulted from the water hole counts held from 1958 to 1976 in the Santa Rosa Mountains (Table 2). This would indicate a stable population.

According to CDF&G, lamb survival was good in the Santa Rosa Mountains between 1970 and 1976; this resulted in a high percentage of young in the population as of 1976. There was a high mortality rate of young recorded by CDF&G the following 2 years.

CDF&G reported that in the spring of 1977, lambs of the previous year (yearlings) suffered a loss of 62 percent. By late summer, practically all of the 1977 yearlings were dead. The 1977 lamb crop decreased 83 percent by July and 94 percent by the following spring. A similar pattern of low lamb survival occurred in 1978. Lamb mortality in 1979 has been moderate up to September, when the last count was made (Table 3).

CDF&G has identified disease as a significant factor in controlling the bighorn population (Payson, 1978). This hypothesis is supported by the loss of yearlings during the spring of 1977. Also, the high juvenile mortality in 1977 and 1978 took place during a period of above average winter and summer precipitation, with optimum food and water conditions.

Water hole counts of Peninsular bighorn in the McCain Valley WHA since 1971 have estimated lamb-to-ewe ratios from 0:100 to 52:100 with the lowest lamb-ewe ratios occurring from 1975 to 1978 (Anza-Borrego State Park files). A slight increase in the lamb-to-ewe ratio was recorded in 1979. Similar fluctuations of lamb-to-ewe ratios were reported for Nevada bighorn by McQuivey (1978) from 1969 to 1976.

Table 2. California Department of Fish and Game
Bighorn Water Hole Census in the Santa Rosa Mountains.

Census Dates	Number per 100 Ewes Rams	Yearlings	Lambs	Sample Size
7/6 - 7/8 1976	40	36	47	205
6/30 - 7/2 1973	53	27	46	272
7/7 - 7/9 1970	50	18	40	221
8/27 -8/29 1968	100	0	15	112
8/23 -8/25 1966	118	24	52	108
7/7 -7/10 1965	42	26	26	266
7/6 - 7/9 1964	70	12	44	113
7/8 -7/11 1963	55	33	37	110
6/26 -6/28 1962	61	10	42	132
7/6 - 7/8 1961	31	0	18	106
6/23 -6/26 1959	77	0	33	63
7/15 -7/18 1958	77	11	20	92

California Department of Fish and Game
Table 3. Bighorn Herd Composition Counts in the Santa Rosa Mountains.

Date	Number per 100 Ewes Rams	Yearlings	Lambs	Sample Size
9-25-79*	52	4	21	99
6-25-79*	26	6	30	112
6-11-79*	11	9	36	69
5-28-79*	2	2	30	89
4- 3-79*	38	7	49	107
10-18-78*	30	4	9	67
6-20-78*	24	4	12	69
9-15-77	51	0	7	46
7- 3-77	28	14	12	76
4-10-77	18	37	61	82
9- 2-76	66	48	38	73
7- 7-76	40	36	47	205
5-26-76	8	46	50	49

* Helicopter count

Habitat Maintenance and Improvement

Water availability throughout the Santa Rosa WHA is good compared to other desert ranges where bighorn occur (Weaver and Mensch, 1970).

However, management directives and projects should be oriented toward insuring that bighorn are provided every opportunity at comprehensive utilization of bighorn habitat. Measurement of habitat utilization must be concurrent with any projects involving habitat improvement, specifically water development. Improvements should generally involve maintenance of old and development of new water sources, with the emphasis in water development toward decentralization of bighorn away from the few permanent summer water holes. This not only provides additional water during severe summers, but also decreases the burden placed on vegetation by bighorn in summer concentration areas.

Water developments should be evaluated annually to measure the degree of utilization by bighorn and other species and to identify the need for modifications to more efficiently meet the requirements of wildlife.

Human Disturbance

Of all bighorn use areas, summer concentration areas (designated vital on Map 4) are the most sensitive to human disturbances. Springs are the focal point for bighorn use of these areas and also have an attraction for people due to their esthetic appeal. Because of repeated human disturbance, bighorn have abandoned the use of Magnesia Spring for a period of years (Blong, 1967). The critical period for this bighorn and human use conflict is June 1 to September 30. It is important to note that the primary lambing areas are also located within the bighorn summer concentration areas.

Important wildlife habitat in the Santa Rosa WHA has been marred by unauthorized roads and trails. A road which was illegally constructed on public land in 1967 crosses primary and secondary bighorn habitat north of Highway 74. Jeep trails continue for over 2 miles into Martinez and Agua Alta canyons from their point of divergence and allow vehicle access to primary bighorn habitat. A jeep trail has been pushed into the mouth of Guadalupe Canyon to an area where bighorn presence was documented in 1970 and where bighorn use was rated heavy by Light and Wessman in 1972. The area has been identified as intermittently vital to bighorn in this plan. A hiking-equestrian trail from the mouth of Dead Indian Canyon to Dunn Road crosses critical ram and maternal areas (primary habitat) (Jack Turner, pers. comm.). A hiking-equestrian trail located in the Bear Creek Canyon drainage crosses an intermittently vital area of bighorn habitat. The "Guadalupe" trail bisects the Guadalupe Creek and Devil Canyon drainages, an area also intermittently vital to bighorn.

There are cattle in trespass on BLM land in the Petrero Spring area, at least some owned by a Forest Service leasee. While Petrero Spring is on private land, the cattle have been driven along Dunn Road from the spring and have been observed near the base of Haystack Mountain in secondary bighorn habitat and very near primary habitat. Observations of the trespass cattle have increased over recent years, and cattle sign is being observed an increasing distance from Petrero Spring.

Poaching of bighorn in the Santa Rosas has occurred due to the relatively large population of bighorn sheep, (Weaver and Mensch, 1970). It is extremely difficult to evaluate the effect of poaching on the bighorn population. Poaching still occurs, however, as evidenced by the recent apprehension of poachers in the Anza-Borrego Desert State Park.

b. OTHER LISTED WILDLIFE SPECIES

Desert Slender Salamander

The WHA supports the only known population of the desert slender salamander (Batrachoseps aridus), state and federally listed as endangered. This species was discovered in the Santa Rosa Mountains in 1969 by Game Warden Russell Murphy. The only known habitat consists of an earthen ledge and limestone cliff approximately 50 meters long. Due to its very restricted distribution, the animal was placed on the state's list of endangered species in 1971. The desert slender salamander was federally listed as endangered in 1973 (Brame, 1970).

In 1974, an ecological reserve was established by action of the California Fish and Game Commission for the protection of the salamander and preservation of its habitat and adjacent watershed. In May 1974, an advisory committee was formed to provide the CDF&G with a pool of expertise that would assist in the management of the reserve. This committee has prepared a management plan for the area. The BLM and CDF&G fully support the recommendations made by the advisory committee in this management plan.

The Fish and Wildlife Service in an announcement of May 16, 1975, defined critical habitats as "the entire habitat or any portion thereof, if and only if, any constituent element is necessary to the normal needs or survival of the species." The 400 acre watershed which supplies the salamander site with water fits the criteria in the definition. An evaluation done by the CDF&G Associate Hydraulic Engineer on November 24, 1976, indicated that removal of groundwater above the site could reduce or stop the flow to the salamander site. Critical as this watershed is, 80 percent is privately owned and much of the land has been subdivided and cleared for homesites (Zabriskie, unpubl.). This situation characterized the existing and potential problems of

managing checkerboard[1] land. One primary, long term goal of the advisory committee is the consolidation of this watershed under public ownership.

Magic Gecko

The magic gecko (Anarlylus suitaki) has only recently been discovered in the U.S. and populations may represent a distinct species. Although not recorded in the Santa Rosa Mountains, its occurance there is likely. This species was listed as rare by the State of California on June 27, 1980.

Least Bell's Vireo

The Least Bell's Vireo (Vireo belli pusilus) has been recorded within the WHA in Palm Canyon (Goldwasser, 1978) and within a mile of the boundary on Highway 74 (Steve Cardiff, pers. comm.). Sightings of this subspecies have been increasingly rare since 1940. In a study done in 1978 for CDF&G, 89 territorial males or pairs and one unmated male were recorded in seven southern California counties. Brown-headed cowbird parasitism was cited as the primary cause of decline (Goldwasser, 1978). The Least Bell's Vireo was listed as endangered by the State of California on June 27, 1980, and is also on the Audubon Society's Blue List of birds declining in all or portion of their range (Arbib, 1979).

Golden Eagle

There are five recorded Golden Eagle (Aquila chrysaetis) nesting sites in the WHA. It is very likely that there are additional sites not yet recorded. The Golden Eagle requires large open areas to forage and successfully raise young. The foraging areas of breeding pairs studied in Idaho by Dunstan et al in 1978, and Smith and Murphy in Utah in 1973, averaged approximately 23 km^2 (60 mi^2) per breeding par. The protection of large, relatively undisturbed ranges such as the Santa Rosa Mountains is essential if the declining desert population is to be stabilized. The Golden Eagle is proposed for listing as sensitive by the BLM.

Prairie Falcon

Five active Prairie Falcon eyries have been recorded, primarily in the northern portion of the range. Prairie Falcons have been placed on the Audubon Society's Blue List (Arbib, 1979) and are generally believed to be declining in numbers. The California desert is thought to support the largest remaining populations in

1 Checkerboard land denotes an alternating land ownership pattern. Generally, even sections are publicly owned and odd sections are privately owned.

California. The northern portion of the WHA has been recognized as a raptor concentration area by the BLM Desert Plan Staff, and further inventories will probably add to the number of recorded nesting pairs.

Summer Tanager

The Summer Tanager (Piranga rubra) is proposed for listing by the BLM as sensitive. This species may occur within the boundaries of the WHA, possibly in the riparian areas of Palm Canyon.

c. GAME SPECIES

The WHA supports a number of small game species which should be highlighted for their recreational value for sport hunting. The principal game species are Gambel's Quail (Lophortyx gambelii), California Quail (Lophortyx californicus), Mountain Quail (Oreortyx pictus), Mourning Dove (Zenaida macroura), Audubon cottontail (Sylvilagus auduboni), and brush rabbit (Sylvilagus bachmani). Hunting for mule deer (Odocoileus hemionus) and black-tailed jackrabbits (Lepus californicus) is of lesser importance. Approximately 100 mi^2 of the WHA is within a State Game Refuge in which the possession of firearms and hunting is prohibited.

d. NONGAME SPECIES

There are many other species present within the WHA. It is the policy of the BLM and CDF&G and the intent of this HMP to preserve, protect, and enhance the habitat supporting these species as well as the habitat of the endangered and threatened species. The vertebrate species list for this HMP has been provided by the University of California through the Philip L. Boyd Deep Canyon Desert Research Center and is included as Appendix 1 (Vertebrates Observed in the Deep Canyon Transect, 1980).

2. VEGETATION

a. VEGETATION ASSOCIATIONS

The Santa Rosa WHA contains a very diverse flora and several unique plant assemblages. This diversity is due in part to the wide range in elevation within the WHA from below sea level at the valley floor to over 7,700 feet along the Santa Rosa ridge. For the purposes of this HMP vegetation has been mapped utilizing a system described by Cheatham and Haller in 1975. The goal of the mapping which began from low level aerial photographs was two fold. First, to give a general overview of the WHA and secondly, to supplement habitat information on bighorn sightings.

The basic map was done at considerable detail on 7 1/3 minute topographical maps. This scale provides for accurate pinpointing of bighorn sightings. For the purposes of this document vegetation types were combined and generalized to provide a more general overview. The following associations were utilized on Map 6.

1. Creosote Bush Scrub - Shrubs, 0.5 - 3 m tall, widely spaced, usually with bare ground between. Dominant plant community below 2,500 feet. Dominant plants include:

Encelia farinosa	Brittlebush
Ambrosia dumosa	Burrobush
Larrea tridentata	Creosote bush
Fouquieria splendens	Ocotillo

2. Enriched Desert Scrub - Shrubs, 0.5 - 3 m tall, similar in aspect to the above but more varied and usually denser. Usually found between 1,000 and 4,000 feet. Dominant species include:

Agave deserti	Agave
Encelia farinosa	Brittlebush
Larrea tridentata	Creosote bush
Opuntia spp.	Cholla
Echinocerus engelmannii	Calico cactus
Ferocactus acanthodes	Barrel cactus
Fouquieria splendens	Ocotillo
Haplopapus spp.	Golden bush

3. Colorado Saltbush Scrub - Usually low, grayish microphyllous shrubs, 0.3 - 1 m tall. Some species are succulent. Dominant species include:

Atriplex canescens	Hoary saltbush
A. polycarpa	Many-fruited saltbush
Prosopis glandulosa var. torreyana	Mesquite

4. Mixed Chaparral - Broad-leaved sclerophyll shrubs, 1.5 - 3 m tall. Generally found above 4,000 feet. Dominant species include:

Quercus dumosa	California scrub oak
Rhus laurina	Laurel sumac
Rhus ovata	Sugar bush
Arctostaphylos spp.	Manzanita
Xylococcus bicolor	Mission manzanita
Yucca schidigera	Mohave yucca

5. Chamise-Red Shank Chaparral - Generally found between 4,000 and 5,000 feet. Varies from 1 - 4 m in height, occasional open ground in between. Dominant plant species include:

Adenostoma fasciculatum	Common chamise
Adenostoma sparsifolium	Ribbon wood
Arctostaphylos spp.	Manzanita
Ceanothus spp.	Ceanothus

6. Desert Dry Wash Woodland - A very open woodland, usually thorny, more or less deciduous trees and shrubs up to 10 m tall with bare ground between. Associated with washes and drainages generally below 1,000 feet. Dominant plants include:

Cercidium floridum	Palo verde
Chilopsis linearis	Desert willow
Dalea spinosa	Desert smoketree
Olneya tesota	Desert ironwood
Prosopis juliflora	Mesquite
Hymenoclea salsola	Cheesebush
Hyptis emoryi	Desert lavender

7. Riparian Woodland - Along streambanks in canyons in areas of permanent surface moisture, often confined to the larger, deeper canyons. Generally found below 5,000 feet. Dominant plant species include:

P. fremontii	Fremont cottonwood
Platanus racemosa	California sycamore
Alnus rhombifolia	White alder
Umbellularia californica	California bay

8. Palm Oasis Woodland - Open to dense dominated by California fan palms growing up to 25 m tall. The understory is sparse in denser groves where ground may be covered with dead fronds. The largest groves are in canyons with permanent streams or adjacent to larger springs, and are restricted to areas with a high water table. Usually found below 3,000 feet. Dominant species include:

Washingtonia filifera	California fan palm
Salix exigua	Slender willow
Populus fremontii	Fremont cottonwood

9. California Pinyon Juniper Woodlands - Dominant association in WHA between 4,500 and 6,000 feet. Dominant species include:

Pinus monophylla	One-leaf pinyon
Juniperus californica	California juniper
Quercus dumosa	Scrub oak

10. Mixed Conifer Forest - Dominated by Jeffery pine. Generally found above 6,000 feet. Dominant species include:

Pinus jeffreyi	Jeffrey pine
Pinus monophylla	One-leaf pinyon

b. PLANT SPECIES OF SPECIAL CONCERN

It is BLM policy to conserve federally and state listed rare, threatened, or endangered plant species in accordance with the Endangered Species Act of 1973. In addition, the Fish and Wildlife Service, Sacramento Endangered Species Office, has compiled draft lists of candidate endangered or threatened plants for California. Pending formal listing, these candidate species will be provided full protection under the Endangered Species Act, unless the BLM State Director judges on a case by case basis that evidence against listing a particular plant is sufficient to allow a specific action. In addition, special management consideration is given to plants listed by the California Native Plant Society (CNPS) List 2 (Plants Rare and Endangered), and U.S. Fish and Wildlife Service Species of Concern. For the informational purposes of this document, any plant on any of the CNPS lists have been included in the following list.

Ayenia compacta - CNPS[1] List 4, a perennial subshrub found in dry rocky canyons, below 1,500 feet, generally associated with Creosote Bush Scrub (Munz, 1974).

Chaenactis parishii - CNPS List 2, FWS[2] Species of Concern, Smithsonian Institute Threatened, a 2-5 dm. erect perennial found on dry rocky slopes, generally associated with Chaparral from 5,000 - 7,000 feet in the San Jacinto and Santa Rosa Mountains (Munz, 1974).

Ditaxis adenophora - CNPS List 4, a 2, 5-4 dm. high freely branched perennial found on sandy flats below 500 feet, generally in association with Creosote Bush Scrub in the Coachella Valley (Munz, 1974).

Ditaxis californica - FWS Candidate Threatened, Smithsonian Institute Threatened, CNPS List 2, a 2-4 dm. perennial becoming weedy basally, found in sandy washes 400 - 3,000 feet, generally associated with Creosote Bush Scrub from the Santa Rosa Mountains to the south side of the Eagle Mountains, Riverside Co. (Munz, 1974).

Marina orcuttii - CNPS List 2, FWS Species of Concern, a low spreading perennial 2-3 in. high found on exposed rocky slopes and decomposed granite soils in the Sheep Mountain area of the Santa Rosa Mountains from 900 to 4,000 feet elevation. In addition to the Santa Rosa Mountains, this species has been recorded in two localities in Baja, Mexico.

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1 California Native Plant Society
List 1 - Plants Presumed Extinct
List 2 - Plants Rare and Endangered
List 3 - Plants Rare but not Endangered
List 4 - Plants Rare in California, Common Elsewhere

2 Fish and Wildlife Service

Penstemon californicus - CNPS List 2, Smithsonian Institute Threatened, a 0.5-1.5 dm. perennial found on stony slopes 3,500 - 7,000 feet, generally associated with Chaparral and Yellow Pine Forest from Hemet through to the Santa Rosa Mountains (Munz, 1974).

Salvia eremostachya - CNPS List 4, a 6-8 dm. perennial found in dry rocky and gravelly areas from 1,200 - 4,500 feet, generally associated with Creosote Bush Scrub on the western edge of the Colorado Desert (Munz, 1974).

II. MANAGEMENT

A. MANAGEMENT OBJECTIVES

1. To maintain the pristine quality of the WHA and preserve and enhance Peninsular bighorn sheep habitat.

2. To establish a land exchange and acquisition program to consolidate public land within the WHA.

3. To encourage the most comprehensive utilization of the range by wildlife through the maintenance and development of water sources.

4. While granting priority to bighorn sheep in resource management, establish guidelines for public use and for the utilization of other resources to minimize impacts on wildlife.

5. To provide for public access to the Santa Rosa Mountains in a manner consistent with the maintenance of existing wildlife values.

6. To maintain the existing diversity of wildlife habitats and species with special attention to endangered, rare, threatened, and other sensitive or unique wildlife and plant species.

7. To establish a basis for a Cooperative Agreement between the BLM and CDF&G and to formalize guidelines coordinating BLM, CDF&G, and U.S. Forest Service management within the WHA.

B. MANAGEMENT CONSTRAINTS

1. SIKES ACT (P.L. 93-452)

This HMP is written under the authority of the Sikes Act of October 18, 1974. The Sikes Act directs the Secretary of the Interior in cooperation with the state agencies to plan, develop, maintain, and coordinate programs for the conservation and rehabilitation of wildlife, fish, and game. The Act states in part that each cooperative agreement entered into shall:

> (A) specify those areas of public land within the State on which conservation and rehabilitation programs will be implemented;
>
> (B) provide for fish and wildlife habitat improvements or modifications, or both;
>
> (C) provide for range rehabilitation where necessary for support of wildlife;
>
> (D) provide adequate protection for fish and wildlife officially classified as threatened or endangered pursuant to Section 4 of the Endangered Species Act of 1973 (16 USC 1533) or considered to be threatened, rare, or endangered by the State agency;
>
> (E) require the control of off-road vehicle traffic;

A Master Memorandum of Understanding between the BLM and CDF&G was signed on February 24, 1969.

2. ENDANGERED SPECIES ACT (ESA) OF 1973 (P.L. 92-205)

It was declared in Section 2 of the ESA that all Federal departments and agencies shall utilize their authorities to conserve plant and animal species listed pursuant to Section 4 of the ESA. Section 7 of the act mandates that Federal agencies shall carry out programs for the conservation of listed species and shall insure that agency actions do not jeopardize the continued existence of a listed species or result in the destruction or adverse modification of the habitat of a listed species. These mandates are nondiscretionary and are supported by civil and criminal penalties. Citizen lawsuits are authorized and could result in penalties being assessed against responsible officials of Federal agencies.

3. WILDERNESS REVIEW

Much of the southern half of the WHA is within a Wilderness Study Area (WSA). The BLM cannot implement any action in a Wilderness Study Area that would impair its potential wilderness characteristics until the wilderness review is completed. (Federal Land Policy Management Act (FLPMA), Sec. 603 b). Use of these lands is subject to the Interim Management Policy and Guidelines for Lands under Wilderness Review dated December 12, 1979.

4. PRIVATE LAND

The HMP applies only to public land, (State and Federal) within the Wildlife Habitat Area. While the constraints do not apply to private land, its presence will affect implementation. Some key parcels of private land have been identified for acquisition through exchange.

C. PLANNED ACTIONS

1. ESTABLISHMENT OF A LAND EXCHANGE AND ACQUISITION PROGRAM

The initiation of an active land exchange and acquisition program is of vital importance and will be given top priority in the implementation of the HMP. Those lands containing vital or primary bighorn habitat or providing access to these areas will be given first priority. Lands containing secondary habitat and then areas of deficiency will in turn be consolidated. However, lower priority lands will not be passed over if the opportunity to acquire them arises. This program should be closely coordinated with implementation of the Land Tenure Adjustment Element in the Desert Plan.

Land exchanges will entail trading BLM land outside of the WHA for private land in the Santa Rosa Mountains. BLM lands to be traded will be identified on a case by case basis depending on the land owners personal preference. However, those lands identified for disposal in the BLM California Desert Plan will provide the base lands for exchange. This includes public land in the Coachella Valley, western Riverside County, and San Diego counties.

Until such time as these lands can be obtained, no action of this plan is intended to restrict the present private use of these lands. Private access to these lands will not be restricted by ORV closures. It will be necessary to develop specific right-of-way routes to these private lands upon demand of the landowners. Access routes to private land must be selected to minimize the impacts to bighorn sheep.

Rationale - Land development and speculation is the primary threat to this population of Peninsular bighorn (Tevis, 1959, 1961; and Ryan, 1968). The Coachella Valley is one of the most rapidly growing areas in the California desert (Stanford Research Institute, May, 1978). The northern portion of the valley including Palm Springs and Rancho Mirage is growing even more rapidly than the southern portion. The current population of Palm Springs is 33,450 and it is expected to nearly double by the year 2000 (Palm Springs Planning Office, pers. comm., 1979). It is this portion of the valley that is having the most immediate effect on the Santa Rosa Mountains. Residential development has advanced to the base of the mountains in this portion of the valley and development along Highway 74, particularly at Black Hill and Pinyon Flats, has increased noticeably in the past 10 years. Major developments in the interior of the Santa Rosa Mountains are planned; which would severely jeopardize the Peninsular bighorn sheep and the integrity of the WHA in general.

The consolidation of land has long been viewed as a necessity in the Santa Rosa Mountains, if the area is to continue to support bighorn. In 1972, an interagency committee, initiated by CDF&G and chaired by the BLM, was established to coordinate land acquisitions and management plans for the area. Represented in this committee were city, County, State, and Federal agencies.

The State Wildlife Conservation Board, working with private entities such as The Nature Conservancy, Heritage Conservation and Recreation Service, and the Society for the Conservation of Desert Bighorn Sheep, has acquired 40 sections of land in the Santa Rosa Mountains.

The Forest Service has been actively consolidating land within the San Bernardino National Forest. The final acquisition of 13 sections appears to be imminent and will do much to consolidate National Forest land within the WHA.

The University of California has acquired 5,527 acres since 1958. This land has been incorporated into the University of California's Natural Land and Water Reserve System as the Philip L. Boyd Deep Canyon Desert Research Center.

In 1974, the BLM acquired 16 sections in the southeastern corner of the WHA through a land exchange package with Southern Pacific Railroad. In 1970, the BLM published an HMP for the Santa Rosas which provided a general description of the multiple use in the area. The primary objective of this original plan was the management of this herd of Peninsular bighorn sheep. The consolidation of land under public ownership was identified as a vital need and listed as a primary objective in the HMP. In 1976, the California State Director of the BLM made commitments to the CDF&G and the State Wildlife Conservation Board that the Riverside District Office would begin preparation of an updated and detailed plan.

The area has been identified in the Land Tenure Element of the Draft Desert Plan as an area where the BLM will attempt to acquire land to consolidate public ownership.

2. MANAGEMENT OF PUBLIC ACCESS (See Map 8)

The following steps will be taken to improve public access into the WHA.

1. The BLM, CDF&G, San Bernardino National Forest, and Anza-Borrego State Park will coordinate in the establishment of additional designated public access points.

2. BLM and CDF&G will work with local government agencies, the University of California, and concerned conservation organizations to provide for and implement opportunities for public education and use of the WHA.

3. The land exchange and acquisition program will be implemented with the recognition that there is a need to improve the management of existing public access.

4. Where appropriate, the BLM will secure reciprocal rights-of-way for public access when granting rights-of-way across BLM land.

5. The U.S. Army Corps of Engineers is presently in the planning stages for flood control projects in Magnesia, Carrizo, Dead Indian, and Bear Creek drainages of the Santa Rosa Mountains. Under the authority of the Fish and Wildlife Coordination Act, the BLM and CDF&G will work with the Corps in matters of public access in connection with the implementation of these flood control programs.

Rationale - The WHA is involved with the management of public lands. It is a plan objective to provide for the public use of the WHA in a manner consistent with the sound management of the wildlife values of the area.

3. CONTROL OF OFF ROAD VEHICLE USE

The following canyons will be closed to motorized vehicles:

Dead Indian Creek Canyon	(T. 6 S., R. 5 E., Sec 12)
Carrizo Canyon	(T. 6 S., R. 5 E., Sec. 12 and T. 6 S., R. 6 E., Sec. 7)
Martinez Canyon	(T. 8 S., R. 7 E., Sec. 4)
Guadalupe Canyon	(T. 7 S., R. 7 E., Sec. 32)

Dead Indian, Carrizo, and Guadalupe Canyons will be closed to motorized vehicles for their entire length; non-motorized access will be provided at the mouths of these canyons. Martinez Canyon will be closed to motorized vehicles beyond a designated point in the canyon (See Map 8 and closure locations).

The vehicle closures will be accomplished using the following methods. In all cases where vehicle access is restricted, pedestrian access will be provided (i.e. walk-through stile, etc). In addition, all barricades will be signed to inform the public of the reason for the closure.

Dead Indian Creek Canyon - The BLM will supplement existing flood control works in the mouth of this canyon with sturdy pipe case fencing to restrict vehicle access. The Army Corps of Engineers has proposed a flood control project for the Dead Indian - Carrizo Canyon area. Should this project be approved, the BLM will work with the Corps to incorporate the appropriate barriers and gates into the design of the project.

Carrizo Canyon - Vehicle closure signs have been repeatedly vandalized at this location, and ORV use and trash dumping continues. Enforcement of the closure will require a sturdy pipe casing locked gate at the mouth of the canyon leaving enough parking space to safely accomodate two vehicles between the gate and Highway 74.

Martinez Canyon - Due to the wide open terrain of this canyon and the fact that the access route changes somewhat year to year following the drainage course, manmade barricades and fences would not be effective or appropriate. Large boulders will be used to block access at the appropriate spot with a sign informing persons of the vehicle closure.

Guadalupe Canyon - A pipe casing gate will be placed on the jeep trail as it crosses the flood control levee in the Section 32, T. 7 S., R. 7 E.

Rationale - The listed roads will be designated as closed to motorized vehicles to reduce conflicts with historical and presently occupied bighorn sheep habitat. Most of the areas to be closed are particularly sensitive, being in or adjacent to water sources used by bighorn and other wildlife and/or lambing areas and are particularly sensitive.

Existing literature on bighorn sheep management defines an explicit need to eliminate vehicular activities in conflict with bighorn sheep populations (Jorgensen, 1974; DeForge, 1972).

4. BIGHORN SHEEP - MONITORING AND STUDIES

The following projects are designed to continue the monitoring of this herd and thus provide updated information to guide in the management of the WHA.

a. HABITAT PREFERENCE FOR BIGHORN SHEEP

Collection of ecological data on bighorn should be continued in order to fully determine the habitat requirements and guide the management of bighorn habitat. This study should provide a comprehensive analysis of the effects of ongoing and proposed developments which pose a direct threat to the normal activity patterns of the bighorn population. Emphasis should be given to those areas north of Highway 74 receiving the highest pressure for development.

Techniques include:

1. Continue compilation of bighorn data on the Wildlife Data Form by CDF&G, BLM, and U.S. Forest Service personnel. This permits efficient categorization and analysis of such data as time, date, location, behavior, number of individuals, sex and age composition, and habitat on each sighting.

2. Continue the integrated exchange of bighorn information between the CDF&G, USFS, and BLM at regular intervals.

3. Wildlife values of habitats threatened by residential development should continue to be assessed in 1980. Emphasis should be placed on habitats within the city limits of Palm Springs, in the area of Martinez Canyon, and in the general area of upper Grapevine Canyon.

b. BIGHORN USE OF WATER HOLES AND ADJACENT AREAS

This project will continue the monitoring of population trends and fidelity to summer concentration areas. The use of individual water holes, particularly those on or adjacent to privately owned lands where habitat alterations pose a threat to bighorn, may be monitored as needed. Efforts should be directed at sheep in presently occupied habitat north of Highway 74.

Techniques include:

1. Dye mark of seasonally concentrated bighorn at water holes. This approach permits accurate evaluation of sheep numbers at water holes through the mark-recount technique. Marked bighorn can be positively identified during consecutive visits to a water hole.

2. Monitor bighorn use of water holes with time-lapse cameras. Cameras can record marked and unmarked bighorn simultaneously at a series of water holes and provide information on fidelity of sheep to an area. Film records can be evaluated repeatedly and are subject to verification, thereby increasing accuracy.

3. Compare the photography results with the counts and classification of sheep by a trained observer at the same water source once a month to calculate an ongoing adjustment factor for the film records.

4. Also, in the years that the California Fish and Game conducts water hole counts in the Santa Rosas, coordinate the dye marking and time-lapse analysis with those efforts.

5. Record utilization of water sources by other species of wildlife.

c. HELICOPTER SURVEY OF BIGHORN HABITAT

The helicopter surveys will be continued to provide comprehensive overview of sheep distribution. Observation of bighorn outside the areas of intensive investigation would rapidly increase the sample size for habitat use analyses. Special consideration will be given to locations and habitat characteristics of maternal (lambing) areas. CDF&G regularly conducts helicopter flights of sheep habitat in the WHA and is expected to continue for the next two years.

Techniques include:

1. Slope, aspect, elevation, and vegetational characteristics of known maternal areas will be located on the vegetation classification map, and areas of similar characteristics will be investigated more intensively on the ground. Additional sightings will be similarly located on the vegetation map.

2. An estimated two flights per year over sheep habitat in the WHA will be conducted through 1982 to assess herd composition. All sheep sightings will be plotted on 15-minute topographic maps.

3. Sheep sightings will be compared seasonally from year to year to delineate consistency or variability in habitat use and fidelity of ram groups, mixed groups, and maternal (ewe-lamb) groups to seasonal use areas.

5. INVENTORY AND MAINTENANCE OF WATER SOURCES

All permanent water sources important to bighorn sheep will be inspected and maintained on a regular basis, preferably in the early summer, to insure a maximum summer flow and retention of water at these critical sources. Water sources may be developed as funding and manpower is made available. Priority will be given to those areas which are of "primary importance" to bighorn yet receive intermittent use due to seasonal water availability. Areas of "secondary importance" and then "areas of deficiency" where the lack of water appears to be a limiting factor will also receive consideration for future water development. Every effort will be made to design and construct self-sustaining, low maintenance developments. The long-term management goal for the WHA will be the uniform distribution of water sources optimally spaced at one per 2 mi^2.

The following spring developments and guzzlers are scheduled for repair in FY 80: (See Map 5 for location).

1. Tahquitz
2. Carrizo Spring
3. Guadalupe Guzzler
4. Toro Guzzler

Should the situation arise where residential development and/or wells lower the water table enough to threaten wildlife water sources, the BLM and CDF&G will be responsible for appropriating water sufficient to meet the wildlife needs of the area.

Rationale - Water is considered to be the most limiting factor affecting populations of desert bighorn sheep. The maintenance of developed water sources is essential to insure the distribution and viability of the population.

6. DESIGNATION OF WATER SOURCES

Due to their locations, water sources at Carrizo Canyon and Magnesia Spring Ecological Reserves are prone to human impacts and are presently designated by CDF&G as official wildlife waters. These reserves are closed to public entry from June 15 to September 30; exceptions to this closure are granted to persons possessing written permission from an authorized official of the CDF&G. No additional protective actions are called for at this time. However, future designation or seasonal designations will be made if conflicts should arise with human use at critical water sources.

Official CDF&G designation would restrict human activity within 200 yards (183 m) of the water source to no more than 30 minutes.

Rationale - Desert bighorn sheep are particularly sensitive and will not tolerate human intrusion at water sources.

7. CONSTRUCTION OF VISTA POINT INTERPRETIVE SIGN

A permanent, low profile sign will be designed and constructed at Vista Point interpreting the resource values of the Santa Rosa Mountains. The entire spectrum of resources in the Santa Rosa Mountains will be covered so as not to duplicate or conflict with the San Bernardino National Forest Bighorn Sheep Overlook. The BLM, CDF&G, and the Wildlife Conservation Board will coordinate in the development of the interpretive display.

Rationale - The Santa Rosa Mountains are a valuable public resource; however, many visitors and even some of the local residents are not aware of the intrinsic values of the mountains. The Vista Point site offers an opportunity to interpret these values and acknowledge the efforts of those groups whose consolidation efforts are working towards the preservation of the area.

8. RESOLUTION OF TRESPASSES

All known trespass cases involving public lands within the WHA will be resolved. Suspected trespasses include cattle grazing, trails, and flood control work. In the case of trails and flood control work the responsible agency or group will be notified and requested to submit an application to legitimize their activities. The environmental assessment prepared in the processing of the application will identify problems and propose mitigating measures.

In the case of the grazing trespass involving a US Forest Service lessee, the BLM and Forest Service will work together to ensure that this problem is controlled. The lessee has been informally notified of the trespass problem on BLM land, and stated that he had been driving the cattle into the area. If after the cessation of driving the cattle continue to drift into bighorn habitat barricades or fencing may be necessary at strategic spots to control the cattle.

Rationale - Each trespass was performed in violation of public land policy and without the benefit of an environmental analysis. Several of the trespasses have taken place within areas of "primary importance to bighorn sheep. Environmental assessments prepared on each of the trespass cases will identify and propose the mitigation of adverse impacts. Seasonal designation or a permit system for trails may be implemented if conflicts become apparent.

9. DESERT SLENDER SALAMANDER SURVEY

The objectives of this investigation are to conduct a comprehensive survey of potential habitat in the Santa Rosa Mountains and to locate and verify the presence of additional populations of desert slender salamander. The BLM will let a contract for a survey to be completed during the winter months when the salamander is most active near the surface and therefore observable. The contractor(s) will survey major spring and seep areas. Areas similar to known habitat will be given priority in the survey; however, the search will not be limited to these areas.

Rationale - The desert slender salamander is an endangered species known to exist at only one locality. No comprehensive survey has been undertaken to determine if other populations exist. This study has been identified as a priority need by the Advisory Committee and will provide information critical to the comprehensive management of this species.

10. MAGIC GECKO SURVEY

A magic gecko survey has been funded for FY 80. The Santa Rosa WHA is within the study area, which includes much of the desert slope of the Peninsular range. The primary emphasis of this study will be to obtain information related to the abundance and distribution of this species and, secondarily, to acquire information on other reptiles and amphibians present within the study area. The investigation will deal with the habitat preferences of the magic gecko and other herpetogauna as determined by such factors as plant association, substrate type, elevation, and slope exposure. The inventory will take place using a variety of techniques, including cruising roads during the day and night, use of lanterns in inaccessible terrains, searching under rocks and debris, and can-trapping.

Rationale - Due to the very limited number of observations, the distribution of this species is only vaguely understood. Further definition of both distribution and habitat requirements is necessary to assure adequate protection for this rare gecko.

11. RAPTOR SURVEY

Surveys will be made annually of the known Golden Eagle and Prairie Falcon eyries to determine productivity. As other eyries are located within the WHA, they will be included in the survey.

12. BIGHORN TRANSPLANT

There is potential for a transplant of Peninsular bighorn sheep to historic range in southern California. The BLM will coordinate with the CDF&G in this effort, particularly in assessing habitat quality at prospective transplant sites.

Peninsular bighorn selected for transplant may come from the Santa Rosa Mountains. Animals selected for transplant should come from a group where the population estimate, population dynamics (lamb survival rates, age structure, and sex ratios), and the interchange-fidelity of individual animals to areas has been precisely defined and where the core group from which animals will be selected for transplant has a high probability of recovering from a reduction in numbers.

D. GUIDELINES

The following guidelines will be implemented as policy in the future management of the Santa Rosa WHA. Implementation of these guidelines will help insure the ability of the Santa Rosa Mountains to support Peninsular bighorn sheep and provide for and regulate use of the area.

1. Constructed recreational facilities such as campgrounds or picnic areas will not be provided or permitted in the WHA. However, the following types of recreation will be encouraged: primitive camping, nature photography, backpacking, horseback riding, etc.

2. The management of public access will be improved, allowing use while at the same time resolving conflicts with the wildlife values of the area.

3. Visitor use will be monitored and appropriate actions taken to correct detrimental impacts or conflicts.

4. Applications for new trails will be critically reviewed. No trails will be permitted that would adversely affect the bighorn sheep use of an area.

5. Application for access roads will be critically reviewed. Care should be taken to establish routes which are the least disturbing to the bighorn sheep use of an area.

6. Bighorn sheep travel routes and vital habitat components will be kept free of roads obstructions, fences, and detrimental human activities.

7. The existing grazing lease will remain at status quo. There will be no increase in the grazing allotment or the AUM (animal unit months) allocation. The present lease will not be transferable.

8. The introduction of exotic plants and animals will not be allowed to occur. Feral grazing animals will be removed from bighorn habitats.

9. The BLM and CDF&G will actively encourage scientific and educational opportunities within the WHA.

10. BLM has proposed surface mining regulations (43-CFR 3809) for public lands which would allow continued mineral extraction in an environmentally prudent manner. Implementation of these regulations would lessen the need for withdrawal of the area from mineral location under the general mining laws, would allow a case-by-case evaluation of proposed mining activities, and would allow for stipulations to protect bighorn sheep. The Wilderness Study Areas have mining regulations in 43-CFR 3802.

III. IMPLEMENTATION AND EVALUATION

When implemented, the following actions will be summarized on Form 66-3, Habitat Management Plan Progress Report. They are dependent on adequate funding and work month allocations and are listed below in order of priority for funding in each fiscal year (FY).

A. Year 1 (FY 80)

Action		Cost	Agency
1.	Submit Federal Register announcement of vehicle closures	1/2 WM* ($925.00)	BLM
2.	Water source maintenance-four sites	1 1/2 WM ($2,775.00)	BLM (YACC) and CDF&G (CCC)
	Equipment, supplies, helicopter time	2,200.00	
3.	Construct barricades for three sites	$500.00	BLM with YACC
4.	Order closure signs for four sites	$100.00	BLM
5.	Herd composition flights (helicopter time)	$3,500.00	CDF&G
6.	Continue identification of threatened habitats	1 WM ($1,850.00)	BLM
7.	Magic gecko survey	$5,000.00	BLM and CDF&G
8.	Survey of known raptor nesting sites	1 WM ($1,850.00)	BLM

B. Year 2 (FY 81)

Action		Cost	Agency
1.	Implementation of Land Exchange Program	10 WM ($13,500.00)	BLM
2.	Write Sikes Act regulations for WHA and submit for publication in the Federal Register	1/2 WM ($925.00)	BLM
3.	Install barricades and vehicle closure signs	1 WM ($1,850.00)	BLM
4.	Resolve trespasses	3 WM ($5,500.00)	BLM

* WM denotes work month. 1 WM = $1,850.00

Action	Cost	Agency
5. Patrol and enforcement of road closures	2 WM ($3,500.00)	BLM and CDF&G
6. Maintenance and development of water sources	1 WM ($1,850.00)	CDF&G (CCC) and BLM (YACC)
7. Herd composition count (helicopter time)	$3,500.00	CDF&G
8. Dye marking and time-lapse camera field work	1 WM ($1,850.00)	BLM
9. Desert slender salamander survey	$9,000.00 (contract)	BLM
10. Design and construct interpretive sign at Vista Point	1 WM ($1,850.00)	BLM
11. Survey of known raptor nesting sites	1 WM ($1,850.00)	BLM

C. FY 82 AND BEYOND

Action

1. Continue land exchange program. An attempt should be made to utilize Land and Water Conservation funds for direct acquisition of critical land.
2. Continue monitoring of Santa Rosa bighorn sheep population.
3. Continue patrol and enforcement.
4. Continue inventory, maintenance, and development of water sources.
5. Coordinate with CDF&G transplant program.
6. Continue surveys of known raptor nesting sites.

IV. COORDINATION WITH OTHER PROGRAMS

The following resource activities would coordinate with this action to the extent that future actions will not adversely affect the accomplishment of the objectives or guidelines mentioned above.

A. LANDS

Much of the implementation of the HMP will involve assistance and coordination with the lands program. The major thrust of the HMP is the land exchange and acquisition program. The program will include preparing a Lands Activity Plan and identifying and classifying those lands suitable for exchanges as well as carrying out the actual exchange or acquisition of land. Other lands actions required for the implementation of this HMP include the resolution of trespasses and applications for access to private land.

B. RECREATION MANAGEMENT

Assistance from the recreation program will be required to design and construct the interpretive sign proposed at Vista Point.

C. WILDERNESS

The area has been recognized for its wilderness qualities, and much of the southern half of the WHA is within a Wilderness Study Area (WSA). The adjacent National Forest Lands are proposed for Rare II designation. Public comments received concerning the proposal of this area as a WSA overwhelmingly pointed out that this area is one of the most pristine and potentially spectacular wilderness areas in the desert. In keeping with this theme and the intent of this HMP, only recreation which does not impair the wilderness values will be allowed within the WHA. (See Guideline 1, 2, and 3).

D. GRAZING MANAGEMENT

The present grazing lease will remain at status quo. There will be no increases in the allotment size or in the number of AUMs allocated. This lease will be non-transferable and there will be no new grazing leases issued in the WHA. Some assistance may be required from the range program to remove feral cattle from the WHA. (See Guidelines 6 and 7).

E. MINERALS

Minerals management assistance will be required in the proper handling of possible mineral leasing actions. Each potential mineral leasing action must be evaluated on a case-by-case basis in order to best insure the protection of bighorn habitat and establish wildlife values as a high priority for the WHA. (See Guideline 10).

F. VEGETATION

Rare and endangered plants within the WHA will benefit from the habitat protection policy stated in this HMP.

G. RANGER AND VISITOR SERVICE PROGRAM

Increased ranger patrol will be required to monitor the proposed vehicle closures. An average of 4 patrol days a month will be required to inspect the vehicle closures and Vista Point. Whenever manpower allows, additional patrols, particularly along Highway 74 and popular canyons, will help create a BLM presence in the area and provide opportunities for Rangers and Visitor Service Specialist to interpret the area's resource values and BLM's goals and policies for the Santa Rosa WHA.

Once regulations have been developed, under the authority of the Sikes Act, for the management of this WHA, CDF&G wardens and BLM ranger will have citation capabilities in the enforcement of these regulations.

H. MAINTENANCE CREWS

Assistance from BLM maintenance personnel and, when available, Young Adult Conservation Corp (YACC) crews will be required to ensure that areas such as Vista Point and the vehicle closures are maintained.

V. PROVISION FOR REVIEW AND MODIFICATION

The Habitat Management Plan will be reviewed annually to determine if revision or modification is needed. Once a year, the BLM Area Manager and representatives of CDF&G will review progress on implementation of the plan and submit a report to the District Manager. This report will be submitted in time to allow for adjustments in the following year's annual work plan.

The report will indicate the following:

1. Progress made on implementing the plan

2. Priorities for future implementation

3. Recommended modifications in the plan or schedule

The District Manager will determine if any recommended modifications are of such a major nature that a new Environmental Assessment Record (EAR) or supplemental EAR is required. Minor changes, such as revised cost estimates, modification of schedules, etc., would not require a supplemental EAR, although some of the individual projects may require supplemental EARs of the Minimal Acceptable Documentation type.

With the concurrence of the District Manager, the recommended modifications will be forwarded to the CDF&G and any other agencies that are parties to any cooperative agreement for their information and approval.

VI. MANAGEMENT EVALUATION

Basic evaluation of the HMP will be completed by using the annual Habitat Management Plan Progress Report.

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Environmental Assessment Record

Santa Rosa Mountains

Habitat Management Plan

Team Leader, Wildlife Biologist	Date 9/2/80
Area Manager, Indio Resource Area	Date 9/2/80
Environmental Coordinator	Date 9/2/80
District Manager, Riverside	Date 9/3/80

I. Description of the Proposed Action

The following actions are proposed in the Habitat Management Plan (HMP) and could, if implemented, significantly impact the resources and/or uses of the Wildlife Habitat Area (WHA)

A. Establish an active Bureau land exchange and acquisition program within the WHA to consolidate Peninsular bighorn sheep habitat under public ownership.

B. Improve the management of public access in the WHA.

C. Control the use of off-road vehicles in areas where their use is detrimental to the maintenance of this population of bighorn sheep.

D. Continue monitoring the bighorn population, and habitat preference.

E. Inspect, maintain, and develop wildlife water sources in the WHA.

F. Construct an interpretive sign at Vista Point.

G. Resolve all known trespass cases involving public lands within the WHA.

H. Conduct inventories for the desert slender salamander and magic gecko to determine the existence and or range within WHA.

II. Alternative Action

No Action Alternative

The No Action alternative would perpetuate the existing situation in which the Bureau has little administrative control or assurance that the public lands will remain viable habitat for the Peninsular bighorn sheep. The Bureau is directed under the Sikes Act to "provide adequate protection for fish and wildlife officially....or threatened, rare, or endangered by the State agency." BLM Manual 6840.06 states that it is Bureau policy to conserve federally and state listed endangered or threatened animals and to utilize its authorities in the furtherance of the purposes of the Endangered Species Act (ESA) and similar state laws. If a no action stand was taken by the Bureau in the Santa Rosa Mountains bighorn sheep and other natural values are expected to be adversely impacted. Therefore, the action alternative is not deemed viable and will not be addressed further.

III. Description of Existing Environment

A. Nonliving Components

1. Climate/air

The WHA is characterized by hot days and warm nights during the summer and mild temperatures during the winter. Rainfall is relatively low 3.65 inches. Snow falls in the higher elevations.

Present sources of petrochemical pollutants are relatively minimal, the major source being emissions from passing vehicles along Interstate 10 and Highway 74. During summer months occasional hazy conditions exist resulting in part from smog "spillover" from the Los Angeles basin. Suspended particulate matter is also minimal except during windy conditions and local "burn days" when agricultural fields are burned in the Coachella Valley.

Refer to HMP for complete description.

2. Topography

Elevation within the WHA varies from just below sea level to 7,726 feet along the Santa Rosa ridge. The topography is varied within these elevation extremes. The lowest elevations, which are in the Coachella Valley, are generally flat sandy washes which graduate into steep, rugged canyons to approximately 4,000 feet. Above this elevation, the topography opens onto chaparral-covered slopes.

3. Geology

The Santa Rosa Mountains contain rocks ranging in age and type from Mesozoic Granitic rocks to quaternary (recent) alluvium. Mineral occurrences are found in many different rock types. Gold, tungsten, asbestos, calcium, corundum, silica and feldspar, and sand and gravel occur within the boundaries of the WHA. Studies contacted by the Desert Plan Staff located areas of mineral potential. The area also has potential for deposits of vertebrate fossils.

There are presently four mining claims within the WHA.

Refer to Appendix for a more complete description.

B. Living Components

1. Vegetation

Ten vegetation associations were identified within the WHA, representing a very diverse flora. Seven plant species of special concern have been recorded within the WHA.

Refer to HMP for complete description.

2. Wildlife

The key species in the WHA is the Peninsular bighorn sheep (Ovis canadensis cremnobates), which is state listed as rare. This bighorn sheep population is one of the densest in California. Other species of concern include desert slender salamander (Batrachoseps aridus), federal and state listed as endangered and three species listed by the state and one species listed as sensitive by the BLM. The WHA supports an exceedingly rich array of wildlife. Refer to the HMP for a more complete narrative on listed species and the Appendix for the species listed in Deep Canyon, compiled by Wilbur W. Mayhew of the University of California.

C. Human Values

1. Socio-economic

The Santa Rosa Mountains are directly adjacent to the Coachella Valley, one of the fastest growing major urban areas in the California Desert Conservation Area (CDCA). The population of Palm Springs is expected to nearly double by the year 2000. Land values are increasing in the areas and far out-distance those in most desert communities. Within the WHA, there has been development on private land to the base of the mountains along the northern slopes and the area around Black Hill along Highway III.

In July 1970, the City of Palm Springs annexed an area of 34 square miles extending the city limits up into the San Jacinto and Santa Rosa Mountains. The annexed area is generally referred to as the Palm Hills. In 1972, a General Plan was written for the area. Individuals from various agencies including the BLM and CDF&G were included in the study committee. The plan addressed among other things, land use, public facilities, transportation, and utilities for the area. Although development oriented, the plan does give special attention to bighorn and other wildlife values. A basic assumption in the Palm Hills General Plan was that BLM land within the area would be available for exchange to consolidate private land.

Due to federal laws, specifically the Federal Land Management and Policy Act of 1976, enacted since the General Plan was written, this assumption is no longer valid. As stated in the attached HMP, the BLM's position in the Santa Rosa Mountains will be one of retention of public lands and where possible, the acquisition of private land through exchange. The base lands for the exchange program would be public lands outside of the WHA.

Until comprehensive management of the area is established for the Palm Hills area, the Palm Hills General Plan will pertain to the private land in the Palm Hills area, and the Santa Rosa Habitat Management Plan will provide guidance for the management of public lands in the area.

2. Wilderness

The proposed wilderness area includes a large contiguous block of BLM and state lands in the interior of the WHA. Public comments were overwhelming in saying this area is one of the most pristine and potentially spectacular wilderness areas in the desert. Refer to HMP Map 3 and Appendix for complete description.

3. Visual Resources

The Santa Rosa Mountains are rugged, boulder mountains displaying a diverse topography and vegetation. These features combine to form a landscape that is highly color-texture dominant.

The area has been rated Visual Resources Management Class II. Scenic quality rating for the area was "A". Changes in the Santa Rosa Mountains to any basic element (form, line, color, texture) caused by a management activity should not be evident in the landscape.

See Appendix for complete discussion.

4. Recreation

The Santa Rosa Mountains offer an outstanding opportunity for wilderness experience and primitive type activities. The majority of the area has not been disturbed by man and retains much of its primeval character.

There are a number of trails through the area, many are utilized during the cooler months by horseback riders for both individual and group rides. There is occasional use of these trails by hikers and backpackers.

Local residents utilize the more readily accessible areas for picnicing, walking, and weekend camping. There is off-road vehicle activity in several areas including the lower portions of some canyons.

Highway 74 provides a scenic drive for many visitors and local residents. Vista Point and the US Forest Service Bighorn Sheep Overlook receive fairly heavy use from persons on Highway 74.

Vista Point and an area just east of Dead Indian Creek Canyon are used by hang-glider enthusiasts.

5. Cultural

Parts of the Santa Rosa Mountains were extensively utilized by the Cahuilla for gathering specific resources. Agave is present in the Santa Rosas and numerous agave roasting pits have been found here. Pinyon/Juniper also exists at the higher elevations. There is some evidence that prior to the drying of Lake Cahuilla, Cahuilla villages were located in the Santa Rosas. When W.P. Blake, a geologist, visited the area is 1853 the local Cahuilla told him that when the lake dried, the Cahuilla moved their villages down from the mountains (probably the Santa Rosas) into the now dry valley floor. W.D. Strong also reported being told that a number of Cahuilla lineages originally lived in the Santa Rosas.

Not a great deal is known archaeologically about the Santa Rosa Mountains. Probably due to the rugged terrain, little archaeological investigation has been done here. A number of sites are known along the eastern edges of the mountains and in canyons such as Martinez Canyon. California Desert Plan Staff Archaeologists recently recorded an extensive series of agave and grinding implements in the Santa Rosas. Certainly a good deal more archaeological material exists here than is presently known.

6. Native American Concerns

The study area includes a large portion of lands traditionally occupied by the Cahuilla. Among the clans who exploited the natural resources (flora, faunal, and geological) within the study area were Sauicpakitum, Wiwaiistam, Costakikum, Se'-o-ya, Wanticinakik-Taminawitum, Kewel, Sewia, and We-wut-now-ku. The surviving members of these clan groups occupy the Santa Rosa, Morongo, Agua Caliente, and Torres Martinez reservations.

IV. Analysis of Proposed Action

1. Anticipated Impacts of Proposed Actions

a. Non-Living Components

No adverse impacts to non-living components are anticipated as a result of the proposed action. The plan may reduce the impacts of future development and construction within the WHA.

b. Living Components

(1) Vegetation

The overall vegetation associations and seven rare/endangered plants species identified in the WHA will not be adversely affected by the HMP. Vegetation will be enhanced by the increased management and protection proposed in the HMP particularly in those areas where motorized vehicles are controlled.

(2) Wildlife

The proposed action is one designed to enhance the wildlife values of the area and ensure that negative impacts to wildlife are minimal.

Wildlife, especially bighorn sheep, will benefit from a long-term program of water source, maintenance and development (when and where necessary). Increased management of recreational activities should minimize the conflicts between bighorn sheep and those persons utilizing the Santa Rosa Mountains.

Information obtained from ongoing inventory studies and future research proposed by the HMP will lead to improved habitat management practices and have a long-term beneficial impact on wildlife.

c. Human Values

(1) Socio-Economic

The land exchange and acquisition program will consolidate public lands within the WHA, making these lands unavailable for development. The conversion of private lands to public administration would result is some loss of tax revenue local city and county governments. However, this can be mitigated by giving priority to land exchanges involving lands within the appropriate city and/or Riverside County.

There is a direct conflict between the General Plan for the Palm Hills area and the Santa Rosa Mountain Habitat Management Plan. The change in the BLM's position on land exchange in the area negates a basic assumption of the General Plan. There have been initial meetings between the BLM and the City of Palm Springs. More comprehensive meetings will take place next year when the City of Palm Springs will be reassessing the Palm Hills General Plan.

The proposed HMP supports Governor Brown's 1978 urban strategy which listed using Federal lands located next to urbanized areas to provide recreational opportunities, wilderness areas, and also to use such lands to promote orderly growth and prevent urban sprawl.

(2) Wilderness

The proposed HMP does not impair the suitability of the area for wilderness.

(3) Visual Resources

The HMP will have little significant impact on the visual resources of the WHA. The closure of areas to vehicle use will have a limited benefit on the local area's scenic quality. The barricades proposed for vehicle closures will be incorporated into existing features and will be placed in areas already disturbed by man's use.

The Vista Point interpretive sign will be designed with a low profile so as not to interrupt the view.

(4) Recreation

The proposed action will restrict the use of vehicles in some areas of the WHA. The management of public access will attempt to increase the public's understanding and appreciation for the area's natural resources and the proposed management guidelines.

There may be some increase in the public use of the Santa Rosa Mountains due to the publicity associated with the release of this document.

The future development of trails will be restricted to those areas where human use would not conflict with the bighorn use of the area.

(5) Cultural Resources

The cultural resources will not be adversely impacted by the implementation of the HMP. The closure of some areas for vehicle use may protect some cultural resources.

(6) Native American Concerns

Road closures and the limitations of vehicle access into the WHA was considered a highly desirable action by the majority of Native Americans contacted. These proposed actions would be consistent with and complement the recommendations of many traditional Native People as a means of limiting impacting activities in the Santa Rosa Mountains.

V. Recommendations for Mitigation

Adverse impacts may result from the possible loss of tax revenues to the county and local governments due to the proposed land exchange and acquisition program. To mitigate this loss we recommend that BLM administered lands within the appropriate city or within the county, but outside of the WHA, be examined first when scoping land exchange possibilities.

VI. Irreversible and Irretrievable Impacts

No irreversible or irretrievable impacts are anticipated as a result of the implementation of this HMP.

VII. Recordation of Persons, Groups, and Governmental Agencies Consulted

BLM Desert Planning Staff
California Department of Fish and Game,
San Bernardino National Forest
Anza-Borrego State Park
University of California, Riverside
Members of the following Cahuilla bands:

Agua Caliente
Torres Martinez
Morongo
Cabazon

VIII. Intensity of Public Interest

The intensity of public interest is high among those persons acquainted with the mountain range. Most of this interest is conservation oriented. Commercial interests in the mountains are centered along Hwy 74 at Pinyon Flat and Black Hill, lower Martinez Canyon and the Dunn Road area. There is a passive appreciation of the Santa Rosa Mountains from many of the local Coachella Valley residents and visitors. See Analysis of Public Comment pages 53 through 55.

IX. Participating Staff

BLM

Faye Davis	Team Leader: Wildlife Biologist
Terry Russi	Wildlife Biologist
Anthony Danna	Range Conservationist/Botanist
Pamela Elliott	Landscape Architect/Outdoor Recreation Planner
Susan Marcus	Geologist
Judyth Reed	Archaeologist
Robert Laidlaw	Ethnographer

CDF&G

Bonnar Blong	Associate Wildlife Manager
Tom Paulek	Assistant Wildlife Manager

ANALYSIS OF PUBLIC COMMENT

The Draft Santa Rosa Mountains Habitat Management Plan (HMP) was released for 45 days of public review on June 17, 1980. The public comment period ended July 31, 1980. Three-hundred twelve (312) landowners were sent copies of a letter notifying them of the draft HMP and giving them a brief synopsis of the proposed actions. Included in the letter was a list of 14 libraries throughout the Coachella Valley and major metropolitan areas of southern California where copies of the plan were available for review. One hundred and four (104) copies were sent to groups, agencies, and individuals that had previously expressed interest in the Santa Rosa Mountains. An additional eighty-six (86) copies were requested by persons, primarily landowners, after the plan was released. Of those persons requesting a copy and voicing an opinion concerning the proposed land exchange program, twenty-four showed support for the program; one letter stated that the landowners were reluctant at that time but wanted more information.

There were twenty-five written or telephoned comments received from persons having reviewed the plan. Twenty-one of the comments received were in support of the HMP and many specifically mentioned support of the land exchange program. Two letters stated that the landowner was not interested in land exchange. Two letters, one from the City of Palm Springs and one from a local developer, were concerned with adequate representation of the General Plan for the Palm Hills area.

Letters include the following questions and comments:

Question: What BLM land is available for exchange outside of the WHA?

BLM Reply: Generally speaking, public lands in the Coachella Valley, western Riverside County, and San Diego County will provide the base lands for exchange. Specific lands will be identified on a case by case basis with interested landowners.

Question: How does this land affect private land?

BLM Reply: This plan was written for the management of public land in the Santa Rosa Mountains. It does not affect private land.

Comment: I support designating the entire (WHA) area Wilderness.

BLM Reply: We agree that the entire area does have wilderness values; however, under the Federal Land Management Policy Act, 1976, the BLM was directed to identify only those roadless areas containing 5,000 acres or more of contiguous public lands as Wilderness Study Areas. The checkerboard land ownership pattern throughout the WHA disqualified much of the area as a Wilderness Study Area. Only that portion of the WHA where state land is intermingled with BLM land was a Wilderness Study Area possible and then only after the state agreed to manage their land as wilderness if the area is designated by Congress.

Comment: There is a need to ensure that a Wilderness (recreation) designation does not impair the quality of bighorn habitat in the WHA.

BLM Reply: The HMP provides a basic framework for the managment of the Santa Rosa Mountains. The Wilderness Suitability Report for the Santa Rosa Mountains, scheduled to be written next year (FY 81), will discuss how Wilderness designation would affect the area. Accompanying the Wilderness proposal to Congress, the report will provide a forum to document management needs prior to designation. Some of the issues that will be addressed are: use of helicopters, maintenance of bighorn water sources, access, fire control, and visitor use restrictions.

Comment: One way to ensure that biocentric management decisions will be made is to establish an Area of Critical Environmental Concern (ACEC) in part of or throughout the whole Santa Rosa WHA.

BLM Reply: The management options available whether an area is designated an ACEC or a habitat management area are basically the same.

Other than broad comments, in support of the intent of the plan, most comments were directed towards updating technical information and points needing further discussion.

In response to the public comment, the following information or sections have been expanded to include additional points. The basic intent of the plan remains the same.

1. General areas were identified where public land will be available for exchange outside of the WHA.

2. The methods to be used in closing vehicle access on identified roads were more fully explained (see page 29).

3. The role of the University of California's Philip L. Boyd Deep Canyon Desert Research Center was more fully explained.

4. Additional trails and ephemeral water sources were identified.

5. The Palm Hills General Plan was identified and the BLM position in relation to that plan was presented.

Appendices

Location Map

Wildlife Habitat Management Area Map #1

Land Status Map #2

Existing Management Map #3

Bighorn Distribution Map #4

Wildlife Water Source Map #5

Vegetation Map #6

Rare Plan Map #7

Roads and Trails Map #8

Wildlife Species List (Philip L. Boyd - Deep Canyon Desert Research Center)

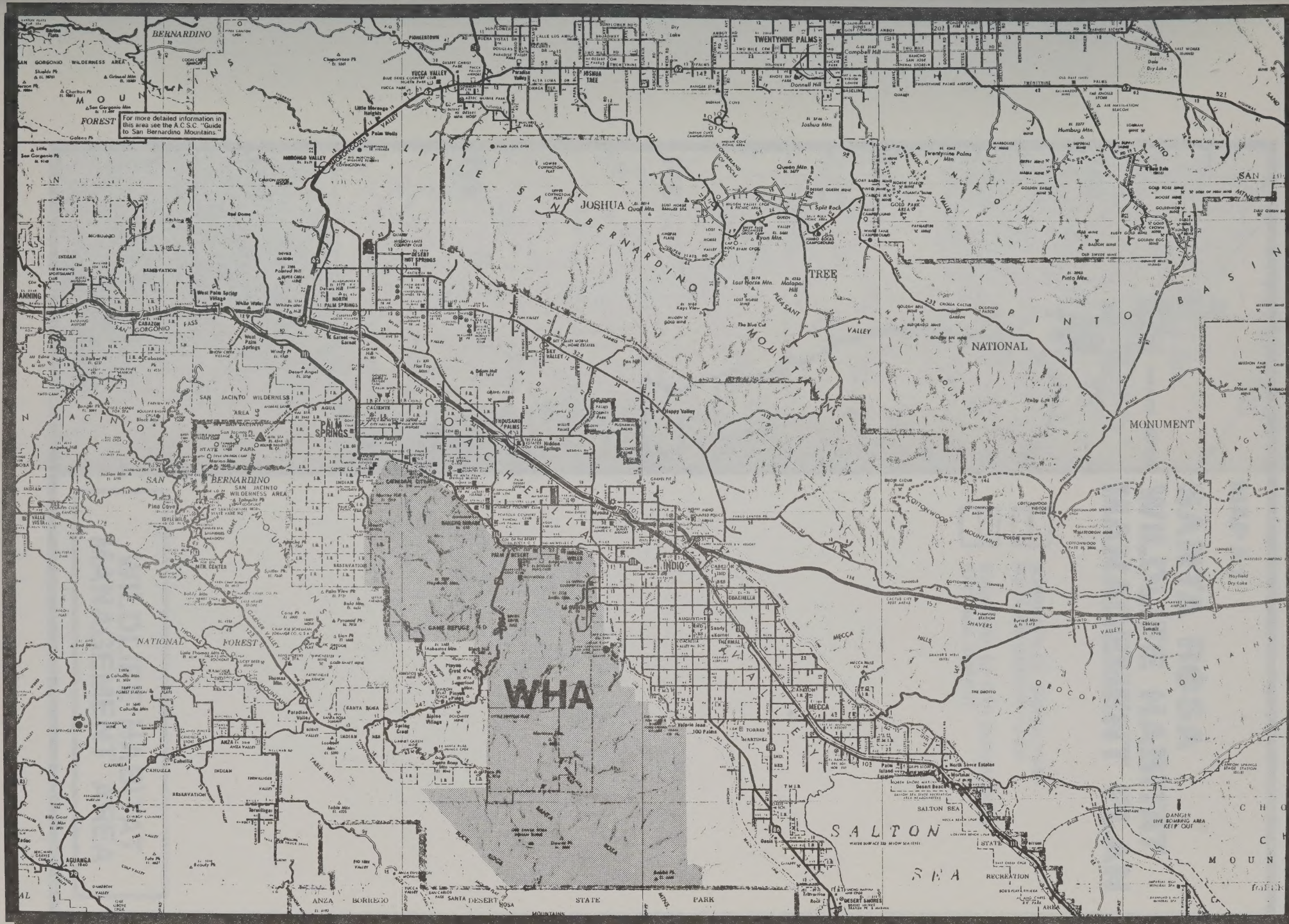
Wilderness Study Area

Visual Resources

Geology

Geology Map #9

Geological Resource Map #10



* WHA - WILDLIFE HABITAT AREA

MAP # 1

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA

BOUNDARY OF SAN BERNARDINO NATIONAL FOREST

PALM SPRINGS

INDIO

HWY 74

T4S

T5S

T6S

T7S

T8S

R4E

R5E

R6E

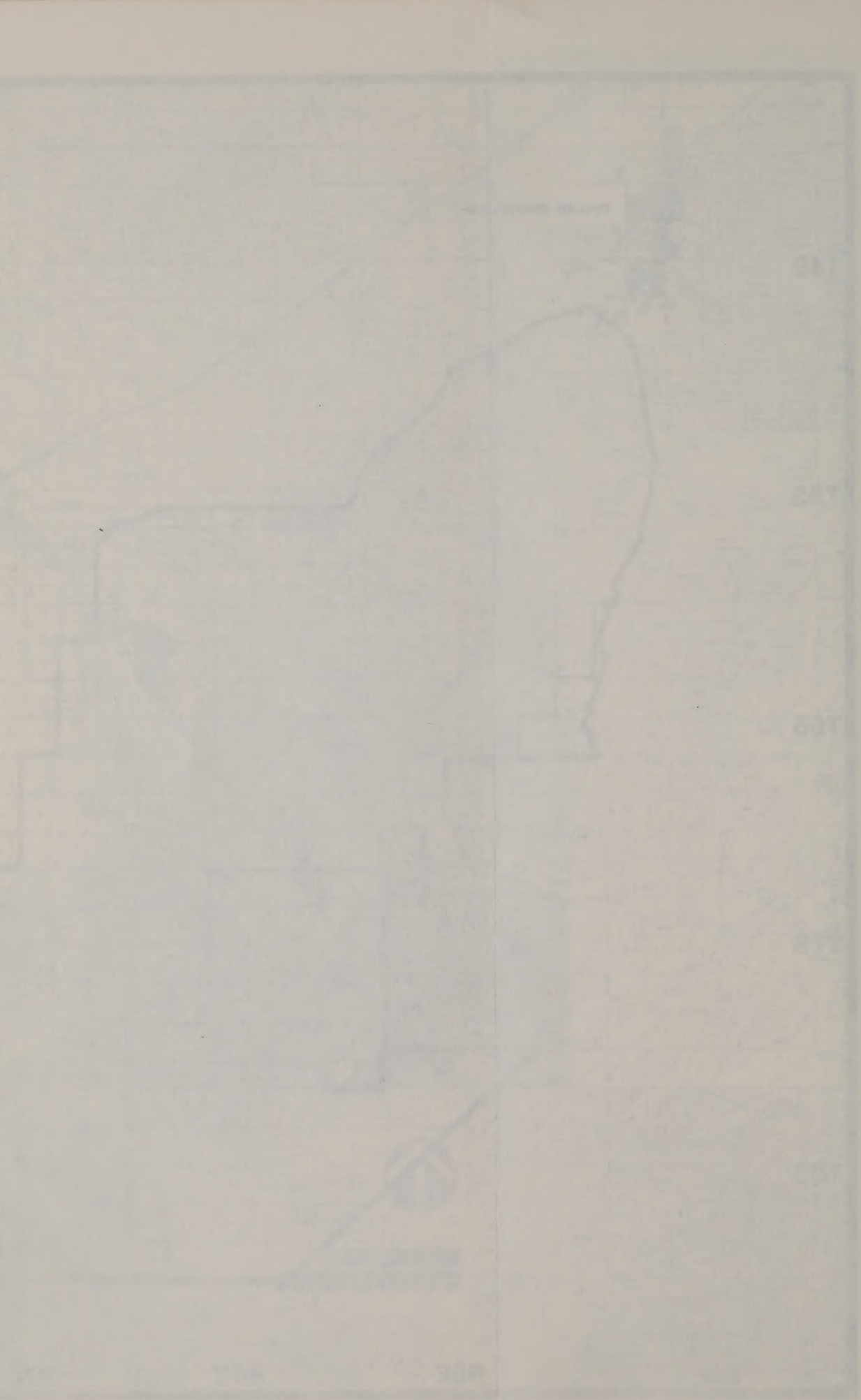
R7E

R8E

KILOMETERS

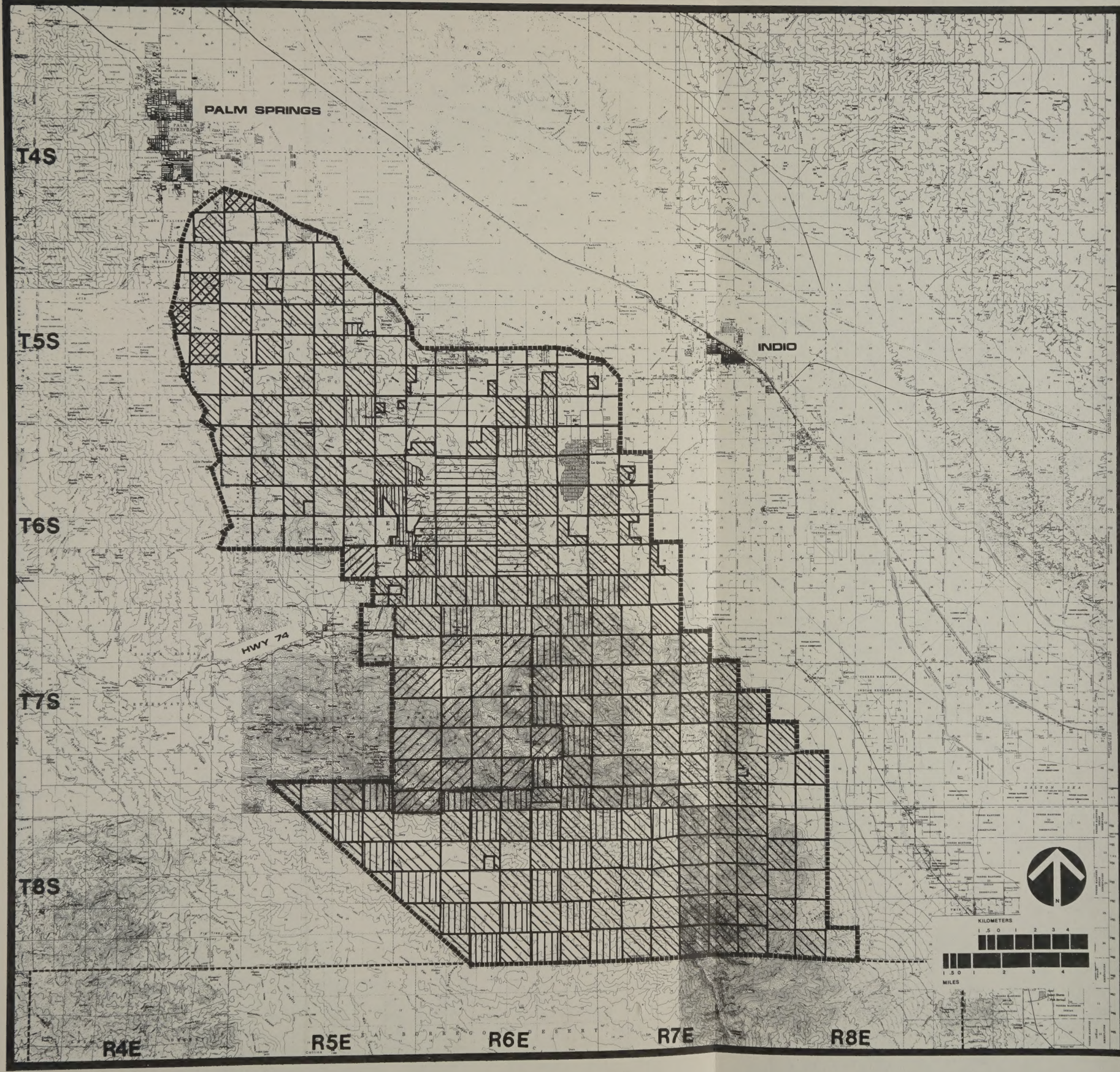
MILES

WILDLIFE HABITAT MANAGEMENT AREA



MAP #2

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

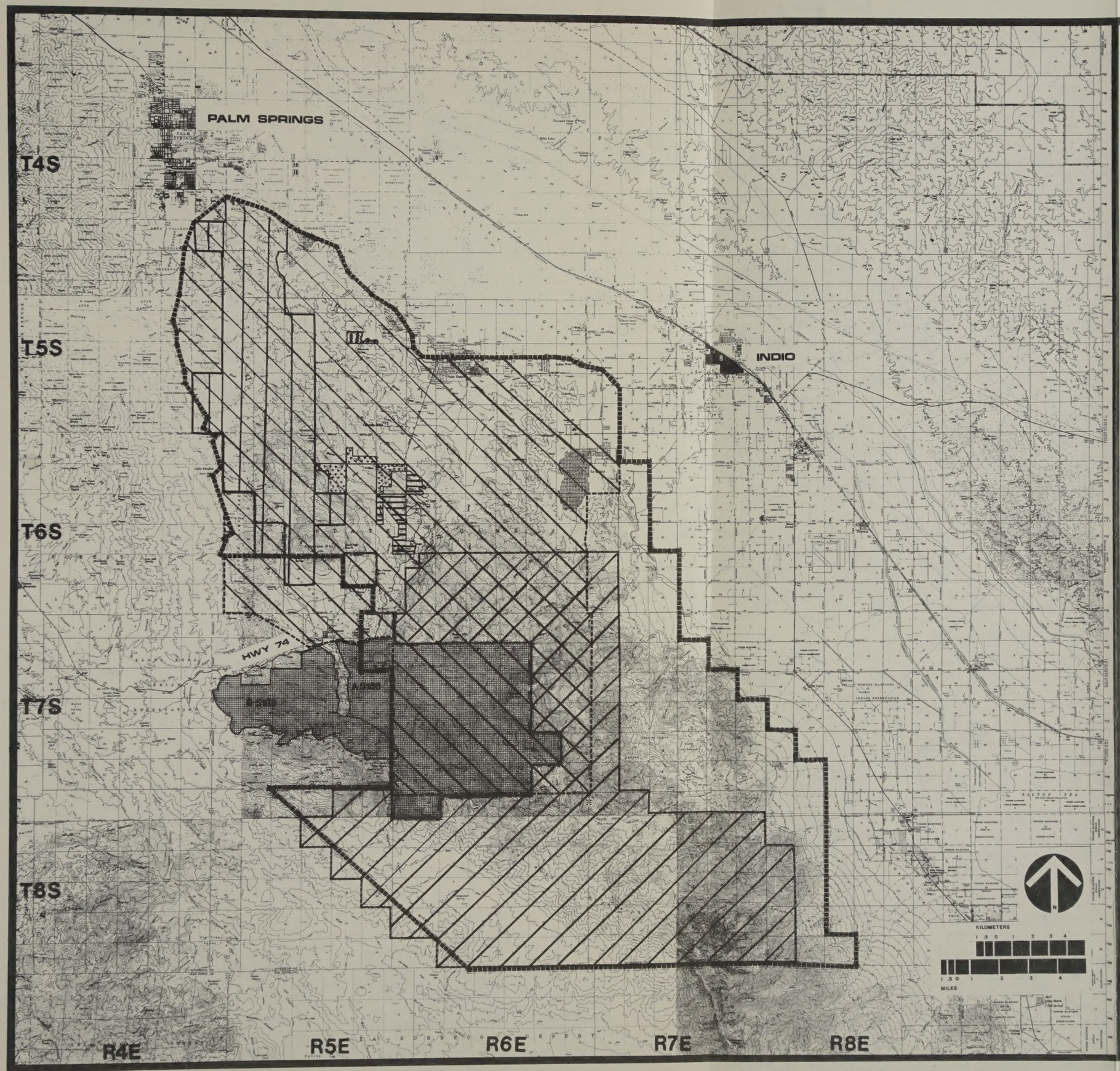


- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- BOUNDARY OF ANZA BORREGO STATE PARK
- BLM LANDS
- U.S. FOREST SERVICE LANDS
- STATE FISH AND GAME LANDS
- UNIVERSITY OF CALIFORNIA
- AGUA CALIENTE
- PRIVATE LAND

LAND STATUS

MAP #3

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

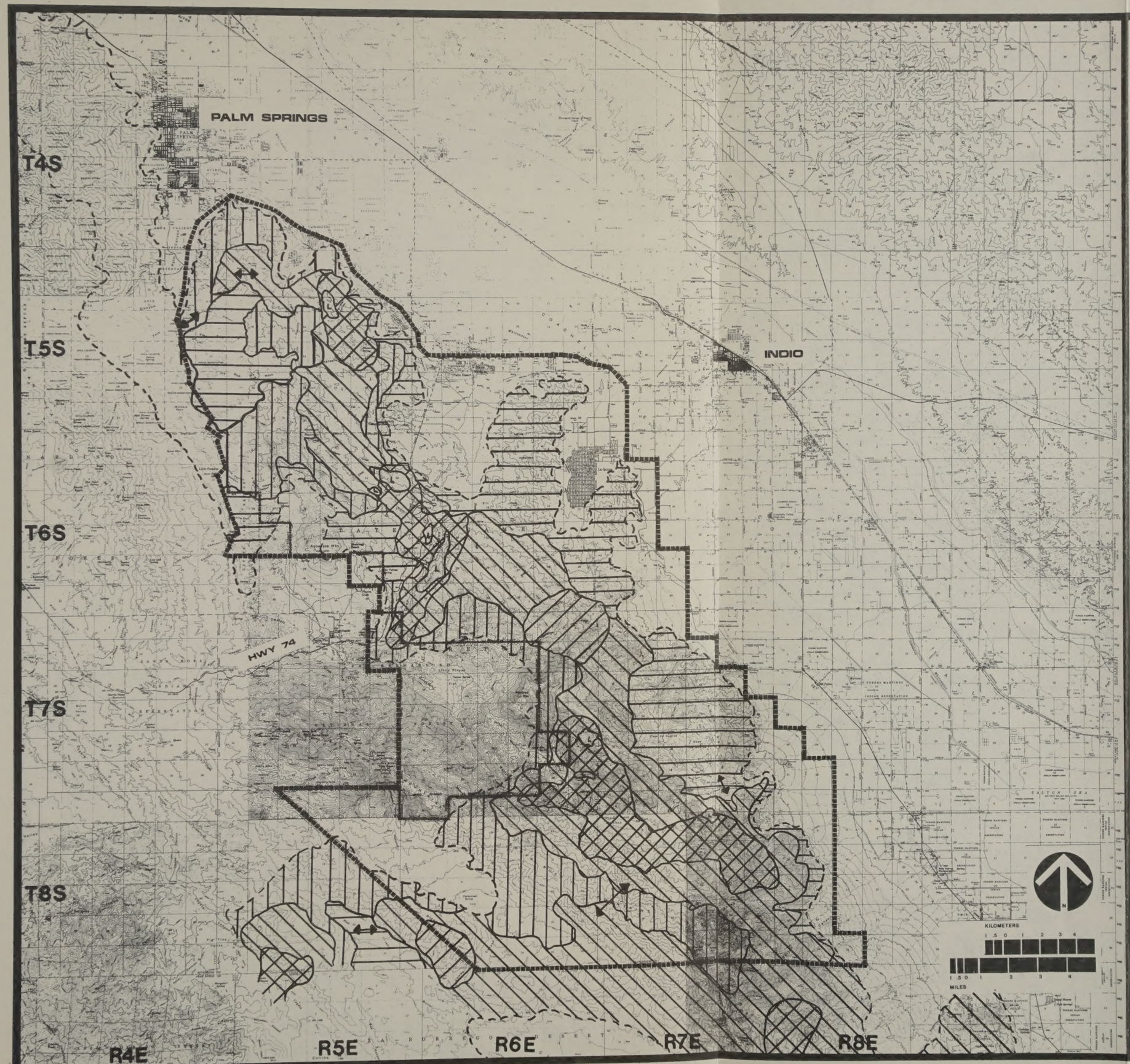


- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- STATE GAME REFUGE BOUNDARY
- DEAD INDIAN CREEK NATURAL AREA (BLM)
- CARRIZO CANYON ECOLOGICAL RESERVE (F&G)
- MAGNESIA SPRING ECOLOGICAL RESERVE (F&G)
- BLM PROPOSED WILDERNESS AREA
- U.S. FOREST SERVICE RARE
- PALM SPRINGS ANNEXATION PALM HILLS

EXISTING MANAGEMENT

MAP # 4

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN



BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA

BOUNDARY OF SAN BERNARDINO NATIONAL FOREST

BIGHORN SHEEP DISTRIBUTION BOUNDARY

VITAL

INTERMITTENTLY VITAL

PRIMARY

SECONDARARAY

ZONE OF DEFICIENCY

L LAMBING

BIGHORN SHEEP DISTRIBUTION

MAP #5

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA

BOUNDARY OF SAN BERNARDINO NATIONAL FOREST

1-21 * PERMANENT WATER SOURCES

21-63 EPHEMERAL WATER SOURCES

△ IMPROVED WATER SOURCES

*NUMBERS CORRESPOND TO NAMES OF SPRINGS. SEE ATTACHED LIST.

WILDLIFE WATER SOURCES

PALM SPRINGS

INDIO

HWY 74

T4S

T5S

T6S

T7S

T8S

R4E

R5E

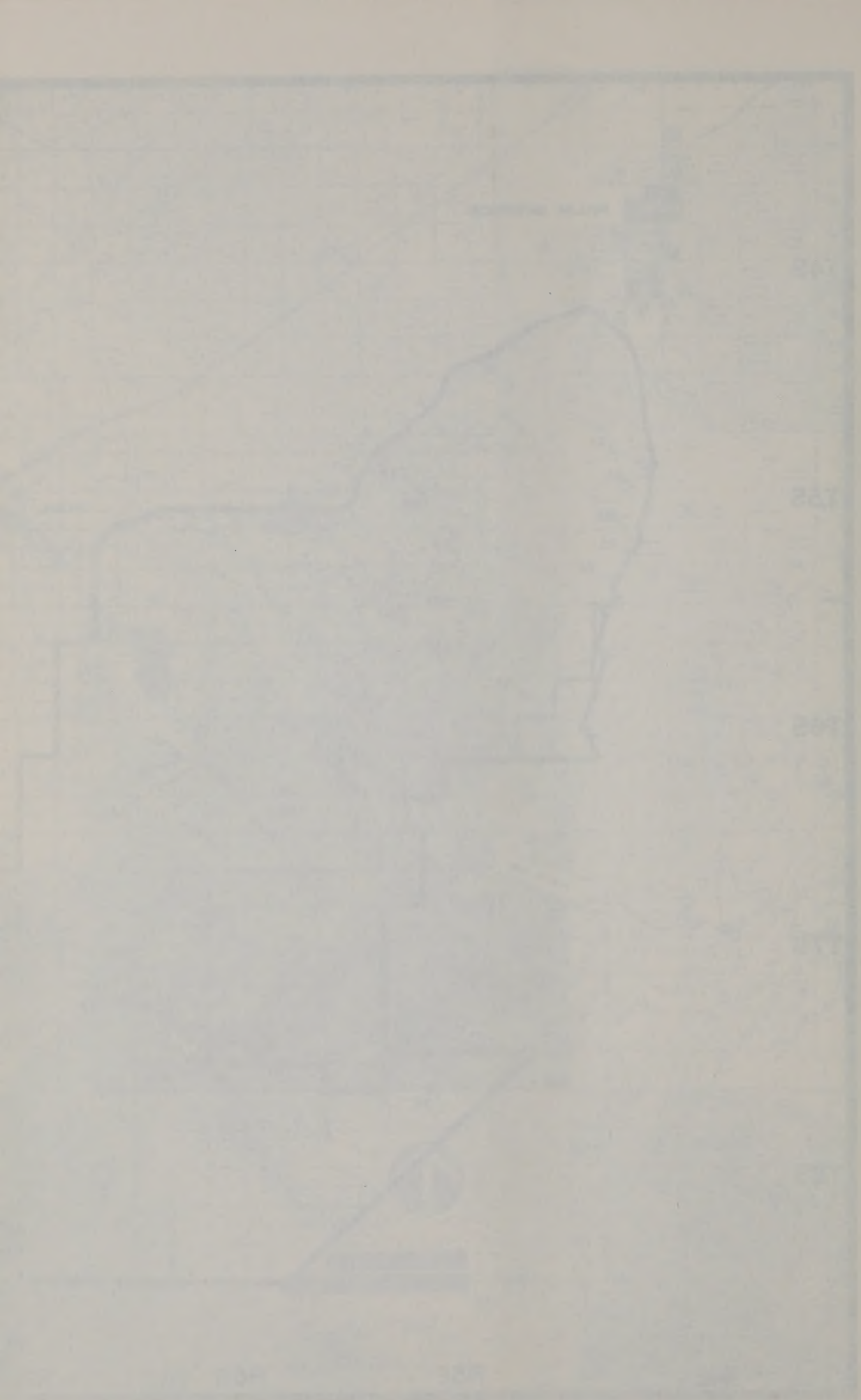
R6E

R7E

R8E

KILOMETERS 1 .5 0 1 2 3 4

MILES 1 .5 0 1 2 3 4



WATER SOURCES

Permanent Water Sources

1 - Thunderbird Trough
2 - Carrizo Spring
3 - Deep Canyon
4 - Deep Canyon
5 - Deep Canyon
6 - Deep Canyon
7 - Tahquitz Spring
8 - Boulder Spring
9 - South Fork Spring
10 - Sumac Upper & Lower
11 - Cottonwood Spring
12 - Rigido Spring
13 - Rockhouse Spring
14 - Nichollas Spring
15 - Bull Spring
16 - Guanche Spring
17 - Cactus Spring
18 - Bear Creek Spring
19 - Agua Alta (improved)
20 - Tahquitz (improved)
21 - Wentworth Spring

Intermittent Water Sources

22 - Palm Canyon Spring
23 - Indian Spring
24 - Palm Oasis
25 - Potrero Spring
26 - Upper Dead Indian
27 - Magnesia Spring
28 - Upper Magnesia
30 - Lower Cat Canyon
31 - Cathedral Spring
32 - Wide Palm
33 - No Name
34 - Bear Creek Seep #1
35 - Bear Creek Seep #2
36 - Bear Creek Spring
37 - Lower Carrizo Spring
38 - Doe Spring
39 - Little Doe Spring
40 - Indian Mountain Tank
41 - Upper Devil Spring
42 - Lower Devil Spring
43 - Lower Guadalupe Spring
44 - Middle Guadalupe Spring
45 - Upper Guadelupe Spring
46 - Toro Guzzler
47 - Toro Spring
48 - Shelter Spring
49 - Upper Aqua Alta Spring
50 - Maiden Hair Spring
51 - Aqua Alta Spring
52 - Poplar Spring
53 - Black Rabbit Spring
54 - Miller Cabin Spring
55 - Buzzard Hole Spring
56 - Buzzard
57 - Thunder Spring
58 - Middle Cottonwood
59 - Cougar
60 - Hillside Spring
61 - Sheep Spring
62 - Petroglyph Spring
63 - No name

MAP # 6

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

PALM SPRINGS

INDIO

HWY 74

T4S

T5S

T6S

T7S

T8S

R4E

R5E

R6E

R7E

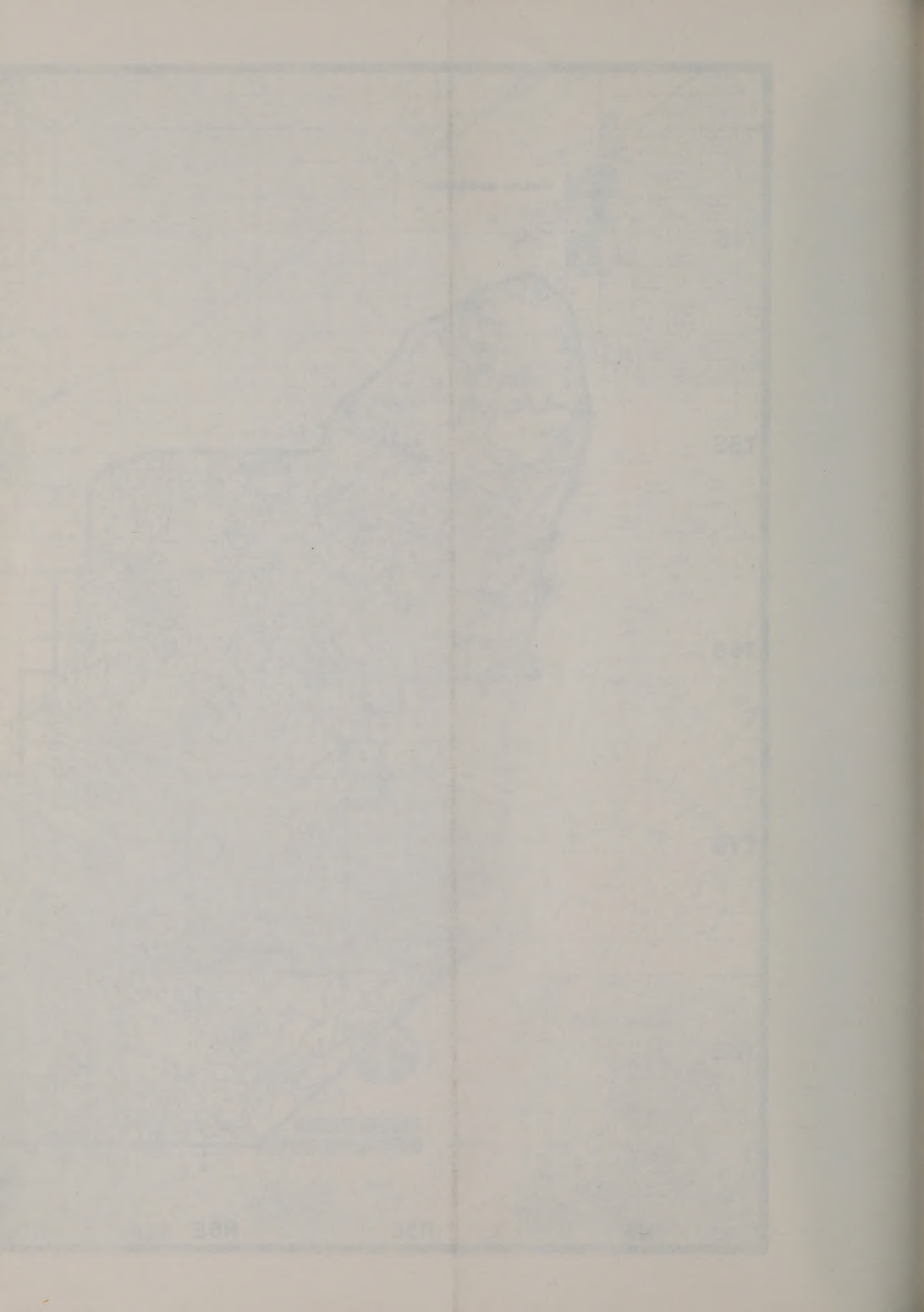
R8E

KILOMETERS

MILES

- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- 1 CREOSOTE BUSH SCRUB
- 2 ENRICHED DESERT SCRUB
- 3 COLORADO SALTBUSH SCRUB
- 4 MIXED CHAPARRAL
- 5 CHAMISE AND RED SHANK CHAPARRAL
- 6 DESERT DRY WASH WOODLAND
- 7 SOUTHERN RIPARIAN WOODLAND
- 8 PALM OASIS WOODLAND
- 9 CALIFORNIA PINYON-JUNIPER WOODLAND
- 10 MIXED CONIFER FOREST
- 11 MAN MODIFIED

VEGETATION



MAP # 7

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

PALM SPRINGS

INDIO

T4S

T5S

T6S

T7S

T8S

HWY 74

R4E R5E R6E R7E R8E

- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- 1 AYENIA COMPACTA
- 2 CHAENACTIS PARISHII
- 3 DITAXIS ADENOPHORA
- 4 DITAXIS CALIFORNICUS
- 5 PENSTEMON CALIFORNICUS
- 6 MARINA ORCUTTII
- 7 SALVIA EREMOSTACHYA
- △ APPROX. LOCATED COLLECTED BEFORE 1945
- ▲ EXACTLY LOCATED COLLECTED BEFORE 1945
- ○ APPROX. LOCATED COLLECTED AFTER 1945
- ⊘ EXACTLY LOCATED AFTER 1945
- ▨ EXACTLY LOCATED, PROBABLY EXTIRPATED AFTER 1945

KILOMETERS 1.5 0 1 2 3 4

MILES 1.5 0 1 2 3 4

PLANT SPECIES OF SPECIAL CONCERN

MAP #8

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

PALM SPRINGS

INDIO

HWY 74

T4S

T5S

T6S

T7S

T8S

R4E

R5E

R6E

R7E

R8E

BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA

BOUNDARY OF SAN BERNARDINO NATIONAL FOREST

ROADS

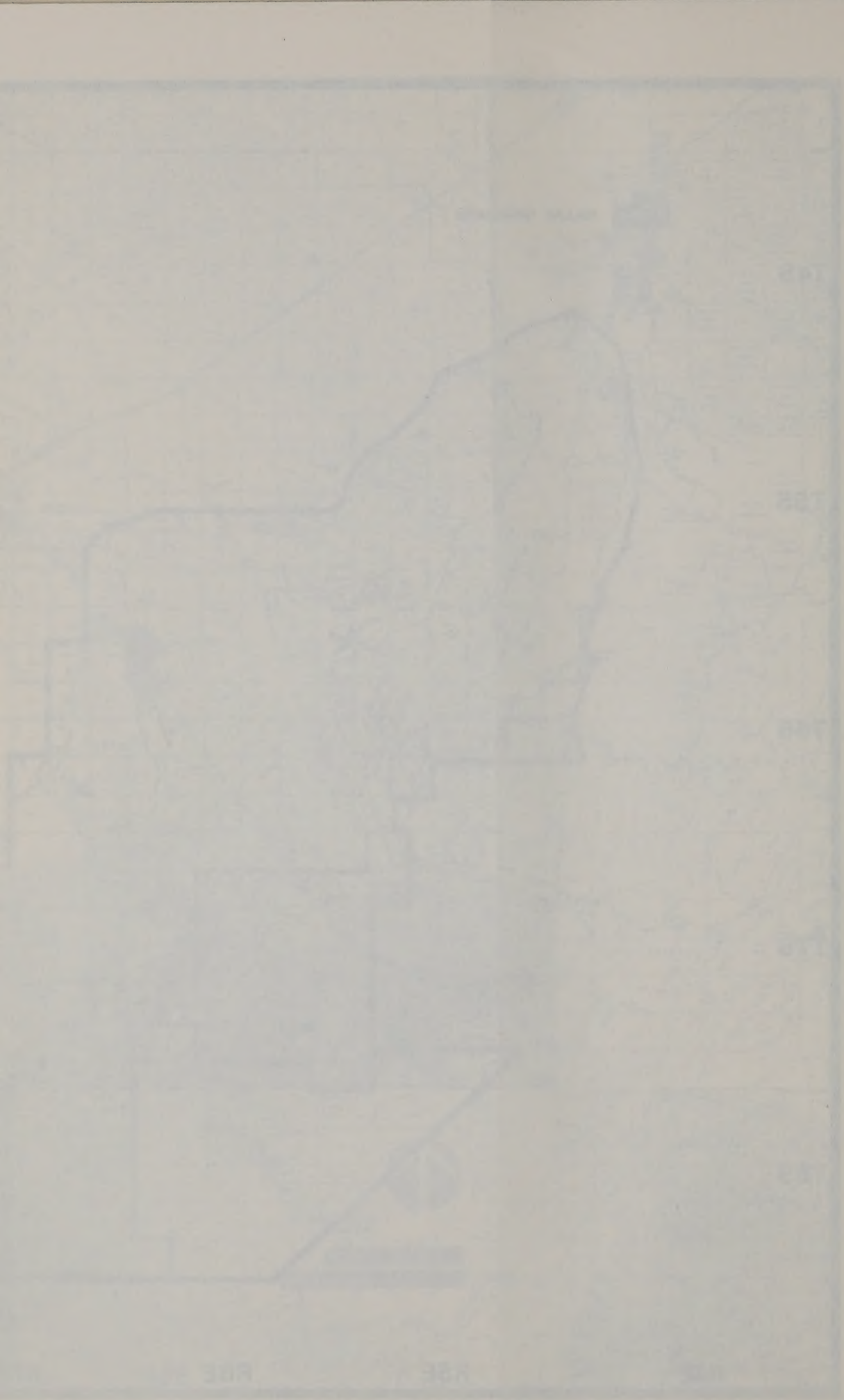
TRAILS

INDICATES VEHICLE CLOSURE LOCATIONS

KILOMETERS

MILES

ACCESS



VERTEBRATES OBSERVED ON THE DEEP CANYON TRANSECT

Wilbur W. Mayhew

1980

This is a list of vertebrates observed to date on the Deep Canyon Transect, which consists of a rectangle 21 miles long by 12 miles wide (34 km. by 19 km.) that includes the Philip L. Boyd Deep Canyon Desert Research Center. The southern boundary includes the summits of Santa Rosa and Toro Peaks. The transect continues in a northeasterly direction, with the eastern boundary passing along the eastern side of Martinez Mountain. The western boundary lies slightly west of Asbestos and Haystack Mountains. The northern boundary is approximately 3 miles northeast of Interstate Highway 10, roughly paralleling the power transmission lines that cross Washington Street and Ramon Road. Elevations on the transect range from 30 feet (9 meters) to 8,716 feet (2,657 meters). The transect contains relatively undisturbed portions of all the major habitat types that occur in this part of southern California.

Species that have been seen on the Deep Canyon Transect, but have not been observed on the Boyd Deep Canyon Desert Research Center to date, are indicated by a cross (+). Those species that have been attracted to this location by the ponds at the Ironwood Country Club are identified by an asterisk (*).

The habitats in which the vertebrates have been observed on the Deep Canyon Transect are indicated by letters in parenthesis following each name. The symbols used for the various habitats are identified on Table 1.

Table 1. Animal Habitats, Deep Canyon Transect

SYMBOL	PHYSICAL FEATURES	PLANT ASSOCIATION
SD	Valley Floor	
	Sand Dunes	Creosote Bush, Mesquite
CBS	Sandy Flats	Creosote Bush, Cheese Bush, Salt Bush
	Alluvial Fan	
CBR	Rocky Plain	Creosote Bush, Cacti
DW	Sandy Desert Wash	Palo Verde, Smoke Tree, Desert Lavender
RS	Rocky Slopes	Creosote Bush, Burro Bush, Brittle Bush Agave, Ocotillo
YG	Lower Plateau	Yucca, Galleta Grass
PJ	Upper Plateau	Pinyon-Juniper Woodland
CH	Lower Montane	Chaparral
CF	Upper Montane	Coniferous Forest
R	Riparian	Willow, Cottonwood, Fan Palm
GR	Golf Course	Grass, Interspersed Trees
W	Artificial Ponds, Lakes	----------
H	Human Habitations	Domesticated Gardens and Trees

AMPHIBIANS

Plethodontidae

+ Desert Slender Salamander - Batracoseps aridis (R)

Bufonidae

* Western Toad - Bufo boreas (W, H)

+ Great Plains Toad - Bufo cognatus (CBS, W, H)

Desert Toad - Bufo punctatus (DW,RS,YG,PJ,R,W)

* Woodhouse's Toad - Bufo woodhousei (W)

Hylidae

Desert Treefrog - Hyla cadaverina (R, W)

* Pacific Treefrog - Hyla regilla (W)

REPTILES

Testudinidae

Desert Tortoise - Gopherus agassizi (CBS, CBR)

Gekkonidae

Banded Gecko - Coleonyx variegatus (SD, CBS, CBR, RS)

Iguanidae

Desert Iguana - Dipsosaurus dorsalis (SD, CBS, CBR, DW, RS, PJ)

Chuckwalla - Sauromalus obesus (CBR, RS, YG, PJ)

Zebra-tailed Lizard - Callisaurus draconoides (SD,CBS,CBR,DW,YG,PJ,R)

+ Coachella Valley Fringe-toed Lizard - Uma inornata (SD, CBS)

Collared Lizard - Crotaphytus collaris (CBR, RS, YG)

Leopard Lizard - Gambelia wislizeni (SD,CBS,CBR,RS,PJ)

Desert Spiny Lizard - Sceloporus magister (CBR, DW, YG, PJ, H)

Granite Spiny Lizard - Sceloporus orcutti (DW,YG,PJ,CH,R)

Western Fence Lizard - Sceloporus occidentalis (PJ, CH, CF, R)

+ Sagebrush Lizard - Sceloporus graciosus (CH, CF, R)

California Rock Lizard - Streptosaurus mearnsi (RS, YG, R)

Brush Lizard - Urosaurus graciosus (SD, CBS, DW)

Side-blotched Lizard - Uta stansburiana (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R)

Coast Horned Lizard - Phrynosoma coronatum (PJ,CH)

Desert Horned Lizard - Phrynosoma platyrhinos (CBS, CBR, DW, RS, YG)

+ Flat-tailed Horned Lizard - Phrynosoma m'callii (SD, CBS)

Xantusidae

Granite Night Lizard - Xantusia henshawi (YG, PJ)

Yucca Night Lizard - Xantusia vigilis (CBR, RS, YG, PJ)

Scincidae

Western Skink - Eumeces skiltonianus (YG, CH, CF,R)

Gilbert's Skink - Eumeces gilberti (PJ)

Teiidae

Western Whiptail Lizard - Cnemidophorus tigris (SD,CBS,CBR,DW,RS,YG,PJ,CH,R)

Anguidae

+ Alligator Lizard - Gerrhonotus multicarinatus (CF)

Leptotyphlopidae

Western Worm Snake - Leptotyphlops humilis (YG)

Boidae

Rosy Boa - Lichanura trivirgata (CBR,YG,PJ,R)

Colubridae

Ringneck Snake - Diadophis punctatus (PJ)

Leaf-nosed Snake - Phyllorhynchus decurtatus (SD, CBS, CBR, RS,YG)

Common Whipsnake - Masticophis flagellum (CBS. CBR, DW, YG, PJ)

Striped Racer - Masticophis lateralis (CH, PJ)

Patched-nosed Snake - Salvadora hexalepis (PJ)

Glossy Snake - Arizona elegans (SD, CBS, CBR)

Gopher Snake - Pituophis melanoleucus (CBS, CBR, PJ, CH, H)

King Snake - Lampropeltis getulus (H)

Long-nosed Snake - Rhinocheilus lecontei (CBR)

Western Shovel-nosed Snake - Chionactis occipitalis (SD, CBS, DW, YG)

Black-headed Snake - Tantilla planiceps (RS, YG)

California Lyre Snake - Trimorphodon vandenburghi (RS)

Spotted Night Snake - Hypsiglena torquata (CBR)

Crotalidae

Red Diamondback Rattlesnake - Crotalus ruber (CBR, DW, RS, YG)

Sidewinder - Crotalus cerastes (SD, CBS, CBR, RS, YG, GR)

Speckled Rattlesnake - Crotalus mitchelli (DW, RS, YG)

+ Western Rattlesnake - Crotalus viridis (CH, CF)

BIRDS

Gaviidae

* Common Loon - Gavia immer (W)

* Arctic Loon - Gavia arctica (W)

* Red-throated Loon - Gavia stellata (W)

Podicepedidae

* Horned Grebe - Podiceps auritus (W)

* Eared Grebe - Podiceps nigricollis (W)

* Western Grebe - Aechmophorus occidentalis (W)

* Pied-billed Grebe - Podilymbus podiceps (@)

Pelecanidae

White Pelican - Pelecanus erythrorhynchos (Migrating over)

Ardeidae

* Great Blue Heron - Ardea herodias (W)

* Green Heron - Butorides virescens (W, GR)

* Cattle Egret - Bubulcus ibis (W, H)

* Great Egret - Casmerodius albus (CBR, W)

* Snowy Egret - Egretta thula (CBR, W)

* American Bittern - Botaurus lentiginosus (W, GR)

Anatidae

+ Canada Goose - Branta canadensis (SD,CBS,CBR,W,GR,H)

* Snow Goose - Chen caerulescens (W)

+ Mallard - Anas platyrhynchos (W, GR, H)

+ Pintail - Anas acuta (SD,CBS,CBR,W,GR)

+ Green-winged Teal - Anas crecca (SD, CBS, CBR,W)

* Blue-winged Teal - Anas discors (W)

+ Cinnamon Teal - Anas cyanoptera (SD,CBS,W)

* American Wigeon - Anas americana (W, GR)

* Northern Shoveler - Anas clypeata (W)

* Wood Duck - Aix sponsa (W)

* Redhead - Aytha american (W)

* Ring-necked Duck - Aythya collaris (W)

* Lesser Scaup - Aythya affinis (W)

* Bufflehead - Bucephala albeola (W)

* Ruddy Duck - Oxyura jamaicensis (W)

Cathartidae

Turkey Vulture - Cathartes aura (SD,CBS,CBR,RS,YG,PJ,CH,H)

Accipitridae

+ Goshawk - Accipiter gentilis (CF)

Sharp-shinned Hawk - Accipiter striatus (SBR, RS, YG,R)

Cooper's Hawk - Accipiter cooperii (SD, CBS, CBR, DW, RS, YG, PJ, CH,CF,R,GR,H

Red-tailed Hawk - Buteo jamaicensis (SD.CBS.CBR.DW.RS.YG,PJ,CH,CF,R,GR,H)

+ Swainson's Hawk - Buteo swainsoni (SD, CBS, CH)

+ Zone-tailed Hawk - Buteo albonotatus (CH, CF)

Golden Eagle - Aquila chrysaetos (RS ,YG)

+ Bald Eagle - Haliaeetus leucocephalus (SD, CBS)

+ Northern Harrier - Circus cyaneus (SD, CBS, CBR, GR)

Falconidae

Prairie Falcon - Falco mexicanus (SD,CBS,CBR,DW,RS,YG,PJ,R,GR)

+ Peregrine Falcon - Falco peregrinus (CBS)

Merlin (Pigeon Hawk) - Falco columbarius (RS,R)

American Kestrel (Sparrow Hawk) - Falco sparverius (SD,CBS,CBR,DW,RS,YG,PJ,CH, CF,R,GR,H)

Phasianidae

California Quail - Lophortyx californicus (DW,YG,PJ,CH,R)

Gambel's Quail - Lophortyx gambeli (SD,CBS,CBR,DW,RS,YG,PJ,CH,R,GR,H)

Mountain Quail - Oreortyx pictus (YG,PJ,CH,CF,R)

Rallidae

+ American Coot - Fulica americana (W, H)

Charadriidae

+ Killdeer - Charadrius vociferus (CBS,CBR,GR,H)

Scolopacidae

* Common Snipe - Capella gallinago (W)

+ Long-billed Curlew - Numenius americanus (SD, CBS)

+ Spotted Sandpiper - Actitus macularia (CBS, CBR, W)

* Solitary Sandpiper - Tringa solitaria (2)

+ Greater Yellowlegs = Tringa melanoleuca (CBS, CBR, W)

Willet - Catoptrophorus semipalmatus (CBR, W)

+ Least Sandpiper - Calidris minutilla (CBS, W)

* Western Sandpiper - Calidris mauri (W)

* Long-billed Dowitcher - Limnodromus scolopaceus (W)

Recurvirostridae

+ American Avocet - Recurvirostra americana (CBS, CBR, W)

+ Black-necked Stilt - Himantopus mexicanus (CBS, CBR, W)

Phalaropodidae

Northern Phalarope - Lobipes lobatus (CBR, R)

Laridae

* Western Gull - Larus occidentalis (W)

+ Ring-billed Gull - Larus delawarensis (CBS)

* Bonaparte's Gull - Larus philadelphia (W)

* Forster's Tern - Sterna forsteri (W)

* Black Tern - Chidonias niger (W)

Columbidae

+ Band-tailed Pigeon - Columba fasciata (CH, CF, R)

Rock Dove - Columba livia (CBS, CBR, YG, PJ, R, GR, H)

White-winged Dove - Zenaida asiatica (SD, CBS, CBR, DW, RS, YG, R, H)

Mourning Dove - Zenaida macroura (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR,H)

+ Spotted Dove - Streptopelia chinensis (H)

Ground Dove - Columbigallina passerina (CBS, CBR, DW, R, GR, H)

Cuculidae

Roadrunner - Geococcyx californianus (SD,CBS,CBR,DW,RS,YG,PJ,CH,R,GR,H)

Tytonidae

Barn Owl - Tyto alba (CBS, CBR, PJ, GR, H)

Strigidae

Screech Owl - Otus asio (CBS, CBR, PJ, CF, H)

Great Horned Owl - Bubo virginianus (CBS, CBR, RS, YG, PJ)

Elf Owl - Micranthene whitneyi (GR)

+ Burrowing Owl - Specotyto cunicularia (AS, CBS, CBR)

Long-eared Owl - Asio otus (DW, YG)

+ Short-eared Owl - Asio flammeus (CBS, CBR)

Caprimulgidae

Poor-will - Phalaenoptilus nuttallii (CBS,CBR,RS,YG,PJ,CH,R,GR)

Common Nighthawk - Chordeiles minor (CBS, CBR)

Lesser Nighthawk - Chordeiles acutipennis (CBS, CBR, DW, YG, R, GR)

Apodidae

Vaux's Swift - Chaetura vauxi (SD,CBS,CBR,RS,YG,R,GR,H)

White-throated Swift - Aeronautes saxatalis (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Trochilidae

Black-chinned Hummingbird - Archilochus alexandri (CBR, DW,YG,R, H)

Costa's Hummingbird - Calypte costae (SD, CBS,CBR,DW,RS,YG,PJ,CH,R,H)

Anna's Hummingbird - Calypte anna (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,H)

Rufous Hummingbird - Selasphorus rufus (CBS,CBR,DW,RS,YG,CH,CF,R)

Allen's Hummingbird - Selasphorus sasin (CBS,CBR,CH,CF,R)

+ Calliope Hummingbird - Stellula calliope (YG, CF)

Alcedinidae

+ Belted Kingfisher - Megaceryle alcyon (CBS, GR, W, H)

Picidae

Common Flicker - Colaptes auratus (SD,CBS,CBR,YG,PJ,CH,CF,R,H)

+ Acorn Woodpecker - Melanerpes formicivorus (CH, CF, R)

Lewis' Woodpecker - Asyndesmus lewis (PJ)

Yellow-billied Sapsucker - Sphyrapicus varius (PJ, CF, R)

Williamson's Sapsucker - Sphyrapicus thyroideus (PJ, CF)

Hairy Woodpecker - Picoides villosus (PJ, CH, CF, R)

Ladder-backed Woodpecker - Picoides scalaris (CBR,DW,RS,YG,PJ,CH,R)

Nuttail's Woodpecker - Picoides nuttallii (PJ, CF, R)

+ White-headed Woodpecker - Picoides albolarvatus (CH, CF)

Tyrannidae

Western Kingbird - Tyrannus verticalis (SD,CBS,CBR,DW,RS,YG,PJ,CH,GR,H)

Cassin's Kingbird - Tyrannus vociferans (RS, YG)

Ash-throated Flycatcher - Myiarchus cinerascens (CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Black Phoebe - Sayornis nigricans (DW, R, GR)

Say's Phoebe - Sayornis saya (SD,CBS,CBR,DW,RS,YG,CH,CF,R,GR)

Willow Flycatcher - Empidonax traillii (PJ)

Hammond's Flycatcher - Empidonax hammondii (RS,YG,PJ,CH,CF,R)

+ Dusky Flycatcher - Empidonax oberholseri (CH, CF)

Gray Flycatcher - Empidonax wrightii (PJ,CF)

Western Flycatcher - Empidonax difficilis (DW,RS,YG,PJ,CH,CF,R)

Western Wood Pewes - Contopus sordidulus (CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Olive-sided Flycatcher - Nuttallornis borealis (CBR, CH, CF, R, GR)

Vermilion Flycatcher - Pyrocephalus rubinus (DW)

Alaudidae

+ Horned Lark - Eremophila alpestris (GR)

Hirundinidae

Violet-green Swallow - Tachycineta thalassina (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF R, GR)

Tree Swallow - Iridoprocne bicolor (SD,CBS,CBR,DW,RS,YG,CF,R,GR)

Rough-winged Swallow - Stelgidopteryx ruficollis (SD,CBS,CBR,DW,RS,YG,CH,CF, R, GR)

Barn Swallow - Hirundo rustica (SD,CBS,CBR,DW,RS,YG,CH,R,GR)

Cliff Swallow - Petrochelidon pyrrhonota (SD,CBS,CBR,DW,RS,YG,R,GR)

Corvidae

+ Steller's Jay - Cyanocitta stelleri (CF, R)

Scrub Jay - Aphelocoma coerulescens (CBR,DW,YG,PJ,CH,CF,R)

Raven - Corvus corax (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Pinyon Jay - Gymnorhinus cyanocephalus (PJ)

+ Clark's Nutcracker - Nucifraga columbiana (CF)

Paridae

Mountain Chickadee - Parus gambeli (PJ, CH, CF, R)

Plain Titmouse - Parus inornatus (YG, PJ, CH, CF, R)

Verdin - Auriparus flaviceps (SD, CBS, CBR, DW, RS, YG, PJ, R, GR)

Bushtit - Psaltriparus minimus (CBR, YG, PJ, CH, CF, R)

Sittidae

White-breasted Nuthatch - Sitta carolinensis (PJ, CH, CF, R)

Red-breasted Nuthatch - Sitta canadensis (PJ)

+ Pygmy Nuthatch - Sitta pygmaea (CF, R)

Certhiidae

+ Brown Creeper - Certhia familiaris (CF, R)

Chamaeidae

Wrentit - Chamaea fasciata (PJ, CH, CF)

Cinclidae

Dipper - Cinclus mexicanus (R)

Troglodytidae

House Wren - Troglodytes aedon (CBR,DW,PJ,CH,CF,R)

Bewick's Wren - Thyromanes bewickii (CBS,CBR,DW,RS,YG,PJ,CH,CF,R)

Cactus Wren - Campylorhynchus brunneicapillus (CBS,CBR,DW,RS,YG,PJ,R,GR,H)

Canyon Wren - Catherpes mexicanus (RS, YG, PJ, CH, R)

Rock Wren - Salpinctes obsoletus (CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Mimidae

Mockingbird - Mimus polyglottos (SD,CBS,CBR,DW,YG,PJ,CH,R,GR,H)

California Thrasher - Toxostoma redivivum (DW, YG, PJ, CH, R)

Le Conte's Thrasher - Toxostoma lecontei (SD, CBS, CBR)

Crissal Thrasher - Toxostoma crissale (CBR, DW)

+ Sage Thrasher - Oreoscoptes montanus (SD, CBS, CBR)

Turdidae

American Robin - Turdus migratorius (CBR, PJ, CH, CF, R, GR, H)

Varied Thrush - Ixoreus naevius (PJ, R)

+ Hermit Thrush - Catharus guttatus (H)

Swainson's Thrush - Catharus ustulatus (DW, PJ, R)

Western Bluebird - Sialia Mexicana (SD,CBS,CBR,RS,YG,PJ,CH,CF,R,GR)

Mountain Bluebird - Sialia currucoides (CBR, PJ, CF, GR)

Townsend's Solitaire - Myadestes townsendi (DW, PJ, CF, R)

Sylviidae

Blue-gray Gnatcatcher - Polioptila coerulea (CBS,CBR,DW,RS,YG,PJ,CH)

Black-tailed Gnatcatcher - Polioptila melanura (SD,CBS,CBR,DW,YG,GR,R)

Ruby-crowned Kinglet - Regulus calendula (CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Motacillidae

* Water Pipit - Anthus spinoletta (CBS, CBR, GR)

Bombycillidae

Cedar Waxwing - Bombycilla cedrorum (CBR, PJ, H)

Ptilogonatidae

Phainopepla - Phainopepla nitens (SD,CBS,CBR,DW,RS,YG,PJ,CH,R,GR,H)

Laniidae

Loggerhead Shrike - Lanius ludovicianus (SD,CBS,CBR,DW,RS,YG,PJ,CH,R,GR)

Sturnidae

Starling - Sturnus vulgaris (SD, CBS, CBR, PJ, GR, H)

Vireonidae

Bell's Vireo - Vireo bellii (DW, PJ, R)

Gray Vireo - Vireo vicinior (RS, YG, PJ, CH, R)

Solitary Vireo - Vireo solitarius (CF, R)

Warbling Vireo - Vireo gilvus (CBS, CBR, RS, YG, PJ, CH, CF, R)

Parulidae

Orange-crowned Warbler - Vermivora celata (SD,CBS,DW,RS,YG,PJ,CH,CF,R,GR,H)

Nashville Warbler - Vermivora reficapilla (CBS,CBR,DW,RS,YG,PJ,CH,CF,R)

Yellow Warbler - Dendroica petechia (CBR, PJ, R, GR)

Yellow-rumped Warbler - Dendroica coronata (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Black-throated Gray Warbler - Dendroica nigrescens (DW,RS,YG,PJ,CH,CF,R)

Townsend's Warbler - Dendroica townsendi (CBS,CBR,RS,YG,PJ,CH,CF,R)

Hermit Warbler - Dendroica occidentalis (YG, PJ, CH, CF, R)

Mac Gillivray's Warbler - Oporornis tolmiei (CBS,CBR,DW,PJ,CF,R)

Common Yellowthroat - Geothlypis trichas (PJ, R)

Yellow-breasted Chat - Icteria virens (DW)

Wilson's Warbler - Wilsonia pusilla (SD,CBS,CBR,DW,RS,UG,PJ,CH,CF,R,GR)

Ploceidae

House Sparrow - Passer domesticus (CBS, CBR, PJ, R, GR, H)

Icteridae

Western Meadowlark - Sturnella neglecta (CBS, CBR, PJ, GR, H)

* Yellow-headed Blackbird - Xanthocephalus xanthocephaslus (GR)

Red-winged Blackbird - Agelaius phoeniceus (CBR, PJ, GR)

Hooded Oriole - Icterus cuculattus (DW, YG, PJ, R, H)

Scott's Oriole - Icterus parisorum (CBS, CBR, DW, RS, YG, PJ, CH, R)

Northern (Bullock's) Oriole - Icterus galbula (CBS,CBR,DW,RS,YG,CH,CF,R,H)

Brewer's Blackbird - Euphagus cyanocephalus (CBS, CBR, CH, GR, H)

Brown-headed Cowbird - Molothrus ater (CBS,CBR,DW,YG,CH,GR)

Thraupidae

Western Tanager - Piranga ludoviciana (CBS,CBR,DW,RS,YG,PJ,CH,CF,R,H)

Fringillidae

\+ Rose-breasted Grosbeak - Pheucticus ludovicianus (CBR, GR)

Black-headed Grosbeak - Pheucticus melanocephalus (CBR,DW,YG,CH,CF,R,GR)

Lazuli Bunting - Passerina amoena (DW, RS, YG, PJ, CH, R)

Purple Finch - Carpodacus purpureus (PJ, CF, R)

Cassin's Finch - Carpodacus cassinii (PJ, CH, CF, R)

House Finch - Carpodacus mexicanus (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR,H)

Pine Siskin - Carduelis pinus (RS, YG, PJ, CH, R)

\+ American Goldfinch - Carduelis Tristis (CBR, CH, R, GR)

Lesser Goldfinch - psaltria (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

\+ Lawrence's Goldfinch - Carduelis lawrencei (CH, CF, R)

\+ Red Crossbill - Loxia curvirostra (CF)

Green-tailed Townee - Pipilo chlorura (DW, PJ, CH, CF, R)

Rufous-sided Towhee - Pipilo erythrophthalmus (DW, PJ, CH, CF, R)

Brown Towhee - Pipilo fuscus (YG, PJ, CH, R)

Abert's Towhee - Pipilo aberti (DW, R, H)

Savannah Sparrow - Passerculus sandwichensis (SD, CBS, CBR, CF,GR)

+ Vesper Sparrow - Poocetes gramineus (SD, CBS)

Lark Sparrow - Chondestes grammicus (CBS, CBR, PJ, GR)

+ Rufous-crowned Sparrow - Aimophila ruficeps (CBS, DW, R)

Black-throated Sparrow - Amphispiza bilineata (CBS,CBR,DW,RS,YG,PJ,CH,R,GR)

Sage Sparrow - Amphispiza belli (SD, CBS, CBR, DW, CH,R)

Dark-eyed Junco - Junco hyemalis (DW, YG, PJ, CH, CF, R)

Chipping Sparrow - Spizella passerina (CBS, CBR, RS, YG, PJ, CH, CF, R)

Brewer's Sparrow - Spizella breweri (SD,CBS,CBR,DW,YG,PJ,CH,CF,R)

+ Black-chinned Sparrow - Spizella atrogularis (CBR, CH, CF)

White-crowned Sparrow - Zonotrichia leucophrys (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF R,GR,H)

Golden-crowned Sparrow - Zonotrichia atricapilla (CBR, YG, PJ, CH, R)

Fox Sparrow - Passerella iliaca (PJ, CH CF, R)

Lincoln's Sparrow - Melospiza lincolnii (R)

MAMMALS

Soricidae

+ Southern California Broad-footed Mole - Scapanus latimanus (CF)

Gray Shrew (Desert Shrew) - Notiosorex crawfordi (CBR, DW, RS, YG)

Vespertilionidae

+ Long-legged Bat - Myotis volans (CF)

+ Small-footed Myotis - Myotis subulatus (CH)

California Myotis - Myotis californicus (PJ)

Western Pipistrelle - Pipistrellus hesperis (CBS, CBR, RS, PJ, GR, R)

Pallid Bat - Antrozous pallidus (CBS, CBR)

Leporidae

Black-tailed Hare - Lepus californicus (SD,CBS,CBR,DW,RS,YG,PJ,CH,R,GR)

+ Desert Cottontail - Sylvilagus audubonii (SD, CBS)

Brush Rabbit - Sylvilagus bachmani (YG, PJ, CH)

Sciuridae

Round-tailed Ground Squirrel - Citellus tereticaudus (SD,CBS,CBR,DW)

Beechey Ground Squirrel - Spermophilus beecheyi (CBR,DW,YG,PJ,CH,CF,R,GR)

Antelope Ground Squirrel - Ammospermophilus leucurus (SD,CBS,CBR,DW,RS,YG,PJ CH,R)

+ Merriam Chipmunk - Eutamias merriami (YG, CH, CF, R)

+ Western Gray Squirrel - Sciurus griseus (CF, R)

Geomyidae

Pocket Gopher - Thomomys bottae (SD, CBS, YG, CH, CF)

Heteromyidae

Little Pocket Mouse - Perognathus longimembris (CBS, CBR, YG PJ)

Long-tailed Pocket Mouse - Perognathus formosus (CBS, CBR, RS)

+ Desert Pocket Mouse - Perognathus penicillatus (SD)

San Diego Pocket Mouse - Perognathus fallax (CBR, RS, YG, PJ)

Spiny Pocket Mouse - Perognathus spinatus (DW, RS, YG)

Merriam Kangaroo Rat - Dipodomys merriami (SD, CBS, CBR, DW, YG)

Nimble Kangaroo Rat - Dipodomys agilis (YG, PJ)

+ Desert Kangaroo Rat - Dipodomys deserti (SD, CBS)

Cricetidae

Deer Mouse - Peromyscus maniculatus (SD,CBS,CBR,RS,YG,PJ,CH,CF)

Canyon Mouse - Peromyscus crinitus (RS, YG)

Cactus Mouse - Peromyscus eremicus (CBS, CBR, RS, YG)

Brush Mouse - Peromyscus boylii (YG, PJ, CH)

Pinyon Mouse - Peromyscus truei (YG, PJ, CH, CF)

+ California Mouse - Peromyscus californicus (CH, CF)

Grasshopper Mouse - Onychomys torridus (CBR, RS, YG)

Desert Pack Rat - Neotoma lepida (CBS,CBR,DW,RS,YG,PJ,CH,CF,R)

+ California Meadow Vole - Microtus californicus (CH, GR)

Muridae

+ House Mouse - Mus musculus (GR)

Canidae

Coyote - Canis latrans (SD,CBS,CBR,DW,RS,YG,PJ,CH,CF,R,GR)

Kit Fox - Vulpes macrotus (SD, CBS)

Gray Fox - Urocyon cinereoargenteus (DW, RS, YG, PJ, CH, CF)

Procyonidae

Ringtail - Bassariscus astutus (RS, YG)

Raccoon - Procyon lotor (CBR, R)

Mustelidae

+ Badger - Taxidea taxus (SD, CBS)

+ Striped Skunk - Mephitis mephitis (CBS)

Spotted Skunk - Spilogale putorius (YG, PJ, R)

Felidae

Mountain Lion - Felis concolor (CBS, YG, PJ, CH, CF, R)

Bobcat - Lynx rufus (YG, PJ, CH, R)

Cervidae

Mule Deer - Odocoileus hemionus (YG, PJ, CH, CF, R)

Bovidae

Desert Bighorn Sheep - Ovis canadensis (CBR, DW, RS, YG, PJ, R)

Some birds, unlike the local amphibians, reptiles, and mammals, move into and out of the Deep Canyon Transect in different seasons. Consequently, they may be present at irregular intervals. The following table indicates the months in which each of the bird species recorded so far has been observed on some portion of the Transect.

Table 2. MONTHS BIRDS OBSERVED ON DEEP CANYON TRANSECT

	J	F	M	A	M	J	J	A	S	O	N	D
Common Loon					X							
Arctic Loon					X	X						
Red-throated Loon										X		
Horned Grebe											X	
Eared Grebe		X		X		X			X	X	X	X
Western Grebe					X						X	
Pied-billed Grebe	X	X	X	X	X	X	X	X	X	X	X	X
White Pelican		X	X	X								
Great Blue Heron											X	
Green Heron		X	X	X	X							
Cattle Egret			X									
Great Egret			X	X	X			X	X			X
Snowy Egret		X	X	X	X							
American Bittern						X						
Canada Goose	X		X								X	X
Snow Goose	X	X										X
*Mallard	X	X	X	X	X	X	X	X	X	X	X	X
Pintail	X	X		X					X	X	X	X
Green-winged Teal	X	X	X		X			X	X	X	X	X
Blue-winged Teal			X									
Cinnamon Teal		X	X	X	X	X		X	X			
American Wigeon	X	X	X	X	X				X	X	X	X
Northern Shoveler										X	X	X
Wood Duck	X	X										X
Redhead			X									
Ring-necked Duck												X
Lesser Scaup												X
Bufflehead			X	X	X							
Ruddy Duck	X	X	X		X		X			X	X	X
Turkey Vulture	X	X	X	X					X	X		
Goshawk						X						
Sharp-shinned Hawk	X		X	X					X	X		
*Cooper's Hawk	X	X	X	X	X	X	X	X	X	X	X	X
Swainson's Hawk				X			X					

* indicates the species is know to nest on the transect.

	J	F	M	A	M	J	J	A	S	O	N	D
*Zone-tailed Hawk			X	X	X	X	X	X				
*Golden Eagle	X	X	X	X	X	X	X	X	X	X	X	X
Bald Eagle			X									
Marsh Hawk	X	X	X	X							X	
*Prairie Falcon	X	X	X	X	X	X	X	X	X	X	X	X
Peregrine Falcon		X										
Merlin (Pigeon Hawk)		X	X							X		
*American Kestrel (Sparrow Hawk)	X	X	X	X	X	X	X	X	X	X	X	X
*California Quail	X	X	X	X	X	X	X	X	X	X	X	X
*Gambel's Quail	X	X	X	X	X	X	X	X	X	X	X	X
*Mountain Quail	X	X	X	X	X	X	X	X	X	X	X	X
American Coot	X		X	X	X	X				X	X	X
*Killdeer	X	X	X	X	X	X	X	X	X	X	X	X
Common Snipe		X	X							X		
Long-billed Curlew				X								
Spotted Sandpiper					X	X		X	X			
Solitary Sandpiper									X			
Greater Yellowlegs	X	X	X	X				X	X			X
Willet								X				
Least Sandpiper		X		X				X	X			
Western Sandpiper	X			X								
Long-billed Dowitcher				X	X							
American Avocet							X	X	X			
Black-necked Stilt						X	X	X				
Northern Phalarope					X							
Western Gull									X			
Ring-billed Gull			X									
Bonaparte's Gull			X	X	X							
Forster's Tern									X			
Black Tern		X										
*Band-tailed Pigeon	X	X	X	X	X	X	X	X	X	X	X	X
*Rock Dove	X	X	X	X	X	X	X	X	X	X	X	X
*White-winged Dove			X	X	X	X	X	X	X	X	X	
*Mourning Dove	X	X	X	X	X	X	X	X	X	X	X	X
*Spotted Dove	X	X	X	X	X	X	X	X	X	X	X	X
*Ground Dove	X	X	X	X	X	X	X	X	X	X	X	X
*Roadrunner	X	X	X	X	X	X	X	X	X	X	X	X
*Barn Owl			X	X	X	X			X	X		
*Screech Owl			X	X	X	X	X	X	X		X	
*Great Horned Owl	X	X	X	X	X	X	X	X	X	X	X	X
Elf Owl					X							
*Burrowing Owl			X	X	X	X	X	X	X	X		
Long-eared Owl	X	X	X	X						X		
Short-eared Owl	X											
*Poor-will		X	X	X	X	X	X	X	X	X	X	X
Common Nighthawk				X								
*Lesser Nighthawk				X	X	X	X	X			X	
Vaux's Swift			X	X	X							
*White-throated Swift	X	X	X	X	X	X	X	X	X	X	X	X

	J	F	M	A	M	J	J	A	S	O	N	D
*Black-chinned Hummingbird			X	X	X	X	X	X				
*Costa's Hummingbird	X	X	X	X	X	X	X	X	X	X	X	X
*Anna's Hummingbird	X	X	X	X	X	X	X	X	X	X	X	X
Rufous Hummingbird			X	X			X	X	X			
Allen's Hummingbird			X	X			X	X	X			
*Calliope Hummingbird					X	X	X					
Belted Kingfisher		X	X	X	X			X	X	X	X	X
*Common Flicker	X	X	X	X	X	X	X	X	X	X	X	X
*Acorn Woodpecker	X	X	X	X	X	X	X	X	X	X	X	X
Lewis Woodpecker	X	X										
Yellow-bellied Sapsucker	X			X		X				X		
Williamson's Sapsucker										X		X
*Hairy Woodpecker	X	X	X	X	X	X	X	X	X	X	X	X
*Ladder-backed Woodpecker	X	X	X	X	X	X	X	X	X	X	X	X
*Nuttall's Woodpecker	X			X	X		X	X	X	X	X	X
*White-headed Woodpecker				X	X	X	X	X	X	X	X	X
*Western Kingbird		X	X	X	X	X	X	X	X	X		
Cassin's Kingbird			X									
*Ash-throated Flycatcher	X		X	X	X	X	X	X	X			X
Black Phoebe	X		X	X	X			X	X	X	X	
*Say's Phoebe	X	X	X	X	X	X	X	X	X	X	X	X
Willow Flycatcher					X							
Hammond's Flycatcher					X				X	X		
Dusky Flycatcher						X	X	X				
*Gray Flycatcher					X	X	X					
Western Flycatcher				X	X		X	X	X			
*Western Wood Pewee				X	X	X	X	X	X			
*Olive-sided Flycatcher					X	X	X	X				
Vermilion Flycatcher				X								
Horned Lark		X									X	
*Violet-green Swallow		X	X	X	X	X	X	X	X	X	X	X
Tree Swallow		X	X	X	X	X	X	X	X		X	
*Rough-winged Swallow		X	X	X	X	X	X	X	X			
Barn Swallow		X	X	X	X	X			X	X	X	
Cliff Swallow		X	X	X	X	X	X	X	X			
*Steller's Jay	X	X	X	X	X	X	X	X	X	X	X	X
*Scrub Jay	X	X	X	X	X	X	X	X	X	X	X	X
*Raven	X	X	X	X	X	X	X	X	X	X	X	X
*Pinyon Jay	X	X	X	X	X	X	X	X	X	X	X	X
Clark's Nutcracker										X	X	
*Mountain Chickadee	X	X	X	X	X	X	X	X	X	X	X	X
*Plain Titmouse	X	X	X	X	X	X	X	X	X	X	X	X
*Verdin	X	X	X	X	X	X	X	X	X	X	X	X
*Bushtit	X	X	X	X	X	X	X	X	X	X	X	X
*White-breasted Nuthatch				X	X	X	X	X	X	X	X	X
Red-breasted Nuthatch	X	X		X								
*Pygmy Nuthatch	X	X	X	X	X	X	X	X	X	X	X	X

	J	F	M	A	M	J	J	A	S	O	N	D
*Brown Creeper			X	X	X		X	X	X		X	X
*Wrentit	X	X	X	X	X	X	X	X	X	X	X	X
Dipper												X
*House Wren			X	X	X	X	X	X	X	X	X	
*Bewick's Wren	X	X	X	X	X	X	X	X	X	X	X	X
*Cactus Wren	X	X	X	X	X	X	X	X	X	X	X	X
*Canyon Wren	X	X	X	X	X	X	X	X	X	X	X	X
*Rock Wren	X	X	X	X	X	X	X	X	X	X	X	X
*Mockingbird	X	X	X	X	X	X	X	X	X	X	X	X
*California Thrasher	X	X	X	X	X	X	X	X	X	X	X	X
*Le Conte's Thrasher		X		X				X				
*Crissal Thrasher			X	X		X						
Sage Thrasher	X	X		X								
*American Robin		X	X	X	X	X	X			X	X	X
Varied Thrush				X								
Hermit Thrush				X	X							
Swainson's Thrush				X	X							
*Western Bluebird	X	X	X	X	X	X	X	X	X	X	X	X
Mountain Bluebird	X	X		X							X	X
*Townsend's Solitaire	X						X	X		X		X
*Blue-gray Gnatcatcher	X	X	X	X			X	X	X	X		X
*Black-tailed Gnatcatcher	X	X	X	X	X	X	X	X	X	X	X	X
Ruby-crowned Kinglet	X	X	X	X	X				X	X	X	X
Water Pipit	X	X	X	X						X	X	X
Cedar Waxwing		X	X	X								
*Phainopepla	X	X	X	X	X	X	X	X	X	X	X	X
*Loggerhead Shrike	X	X	X	X	X	X	X	X	X	X	X	X
*Starling	X	X	X	X	X	X	X	X	X	X	X	X
*Bell's Vireo				X								
*Gray Vireo			X	X	X	X	X	X	X			
*Solitary Vireo					X	X		X	X			
*Warbling Vireo			X	X	X	X		X	X			
*Orange-crowned Warbler		X	X	X	X	X	X	X	X	X		
Nashville Warbler				X	X			X	X			
Yellow Warbler			X	X			X					
*Yellow-rumped Warbler	X	X	X	X	X	X	X	X	X	X	X	X
*Black-throated Gray Warbler				X	X	X		X	X	X	X	
Townsend's Warbler				X	X		X	X	X	X	X	
Hermit Warbler					X			X	X			
MacGillivray's Warbler				X	X			X	X			
Common Yellowthroat					X							
Yellow-breasted Chat					X							
Wilson's Warbler			X	X	X		X	X	X	X		
*House Sparrow	X	X	X	X	X	X	X	X	X	X	X	X
*Western Meadowlark	X	X	X	X	X	X	X	X	X	X	X	X
Yellow-headed Blackbird						X						

	J	F	M	A	M	J	J	A	S	O	N	D
Red-winged Blackbird					X				X			
*Hooded Oriole			X	X	X	X	X	X	X			
*Scott's Oriole		X	X	X	X	X	X	X	X	X	X	X
*Northern (Bullock's) Oriole			X	X	X	X		X	X			
*Brewer's Blackbird	X	X	X	X	X	X	X	X	X	X	X	X
*Brown-headed Cowbird	X			X	X	X	X		X			X
*Western Tanager				X	X	X	X	X	X			
Rose-breasted Grosbeak					X							
*Black-headed Grosbeak				X	X	X	X	X	X			
Lazuli Bunting				X	X	X						
*Purple Finch	X	X		X	X	X	X			X	X	
*Cassin's Finch				X	X	X	X	X				
*House Finch	X	X	X	X	X	X	X	X	X	X	X	X
Pine Siskin	X	X	X	X								X
American Goldfinch			X					X	X			
*Lesser Goldfinch	X	X	X	X	X	X	X	X	X	X	X	X
*Lawrence's Goldfinch				X	X	X	X	X				
Red Crossbill							X					
*Green-tailed Towhee				X	X	X	X		X			
*Rufous-sided Towhee	X	X	X	X	X	X	X	X	X	X	X	X
*Brown Towhee	X	X	X	X	X	X	X	X	X	X	X	X
*Abert's Towhee	X	X	X	X	X	X	X	X	X	X	X	X
Savannah Sparrow	X	X	X	X			X		X	X	X	X
Vesper Sparrow				X								
Lark Sparrow			X	X					X	X	X	
Rufous-crowned Sparrow			X	X				X			X	
*Black-throated Sparrow	X	X	X	X	X	X	X	X	X	X	X	X
*Sage Sparrow	X	X		X	X	X	X	X	X	X	X	X
*Dark-eyed Junco	X	X	X	X	X	X	X	X	X	X	X	X
*Chipping Sparrow	X	X	X	X	X	X	X		X	X	X	X
Brewer's Sparrow	X	X	X	X	X		X		X	X	X	X
*Black-chinned Sparrow				X	X	X	X	X	X			
White-crowned Sparrow	X	X	X	X	X				X	X	X	X
Golden-crowned Sparrow			X							X	X	X
Fox Sparrow	X	X	X	X	X	X	X			X	X	X
Lincoln's Sparrow									X			

Wilderness Study Area

I. PHYSICAL BOUNDARIES

Situated in the Santa Rosa Mountains southwest of Indio, the area is bordered on the east by private land and the roads and streets surrounding Indio. San Bernardino National Forest, Coyote Canyon Road, and Anza-Borrego State Park define the boundaries to the west and south. Highways 111 and 74 mark the northern extreme.

II. LAND OWNERSHIP

For the most part, the site is checkerboarded; approximately 50 percent public land and 50 percent non-public land. A fairly large tract of about 30 sections of contiguous public land occupies the mountain top in the southeast corner of the area. This area has been retained for further wilderness study.

III. DESCRIPTION OF ENVIRONMENT

The area consists primarily of the Santa Rosa Mountains and foothills. These are rugged, boulder mountains displaying highly eroded canyons and washes, valleys, steep cliffs and sheer surfaces. It is surrounded by a relatively short alluvial fan that slopes eastward toward the Salton Sea and contains part of the shoreline of ancient Lake Cahuilla. Vegetation within the boundaries is diverse and ranges through the spectrum from desert (agave, ocotillo, creosote) to mountain (pinyon, juniper). Numerous life zones are included, and each reflects the unique plant life typical of the zone. The large public land tract consists mostly of the main Santa Rosa Mountain mass.

IV. NATURAL CONDITION

The large area of contiguous public land has generally retained its primeval character and influence, with the imprint of man's work substantially unnoticeable. The rugged terrain has limited access into the area, thereby protecting the site and allowing it to maintain its natural character. The public lands in the checkerboard pattern of ownership are included in the Wilderness Study Area. After consultation with California Department of Fish and Game, it was determined that such designation would be compatible with management of their lands.

V. OUTSTANDING OPPORTUNITIES FOR SOLITUDE OR A PRIMITIVE AND UNCONFINED TYPE OF RECREATION

The rugged mountain terrain, in addition to the dense and diverse vegetation patterns, combine to produce numerous areas of isolation. The screening effect of these natural barriers insures outstanding opportunities for solitude. The area is diverse enough to provide a wide variety of primitive-type activities.

VI. SUMMARY OF PUBLIC COMMENTS

Public comments were overwhelming in saying this area is one of the most pristine and potentially spectacular wilderness areas in the desert. These comments will need to be evaluated in the study phase as to whether an enlarged area should be considered.

Visual Resources

The Santa Rosa Mountains are rugged boulder mountains displaying highly eroded canyons and washes, valleys, steep cliffs and sheer surfaces. It is surrounded by a relatively short alluvial fan that slopes eastward toward the Salton Sea and contains part of the shoreline of ancient lake Cahuilla.

Vegetation within the boundaries is diverse and ranges through the spectrum from desert (agave, ocotillo, creosote) to mountain (pinyon, juniper). These features combine to form a landscape that is highly color-texture dominant.

The Santa Rosas have been rated Visual Resource Management Class II. The principal view point of the area is from Highway 74 which is a California Scenic Highway. Scenic quality rating for the area was "A." The VRM Class defines the maximum contrast allowed in the area to preserve the scenic quality. Changes in the Santa Rosas to any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the landscape. A contrast may be seen but should not attract attention. The degree of contrast for any one element should not exceed moderate (2X) and the total contrast rating for any feature may not exceed 10.

Geology

I. Known Mineral Occurrences

The US Bureau of Mines Mineral Industry Locator System (MILS) provided data on most of the known mineral occurrences. The MILS reference numbers are the location numbers used on the geological resources maps. This information was supplemented by Reported Occurrences of Selected Minerals in the Southern Third of California, by Smith et al., which provided a few additional deposits as well as correlation with the MILS.

Brief descriptions of the commodities, occurrences, and estimates of their potential are given below.

Metallics

Gold

The area has potential for gold based on the geology. There are no known former producers in the WHA, however, this does not preclude new deposits producing in the future.

Black Eagle Placer; MILS #111

This occurrences is shown on a map accompanying Tucker and Sampson (1945) but it is not mentioned in the text. It is not known whether rock was crushed and washed for gold or whether it was panned from alluvium. The amount of gold recovered in also unknown. The occurrence is outside the WHA but if it was found in bedrock, the geologic unit containing it extends into the study area.

Tungsten

Scheelite is an ore of tungsten found within the WHA. It is mineral which forms late, usually hydrothermally, in pegmatites or along granite-limestone contacts. It is used as an alloy to harden steel. Occurrences in the WHA have not been thoroughly studied or explored. The potential for finding new occurrences is moderately high, but of course the size and quality of these potential deposits are unknown. Further exploration for scheelite is possible.

Dumbell Mine; MILS #113

Nothing is known about the history and mineralogy of the Dumbell Mine. It occurs in the Cretaceous granitic and metamorphic rocks. Further exploration is possible but not probable.

Miller Ranch; MILS #115

Scheelite occurs along a limestone-granite contact in tactite, a complex metamorphic rock. A shaft and tunnel explored the 2-feet to 7-feet width of scheelite. Values of about 1% WO. Part of the deposit reportedly contains 7000 tones of scheelite (Tucker and Sampson, 1945).

Magnesium Canyon; MILS #161

Scheelite occurs with garnet and epidote in a shear zone (tactite). Samples taken from cute and shafts assayed .8% to 1.5% WO. Part of the deposit reportedly contains 7000 tones of scheelite (Tucker and Sampson, 1945).

Nonmetallics

Asbestos

Asbestos has many industrial uses including heat resistent cloth, paint filler, and brake linings. Asbestos has recently recieved attention and criticism as a carcinogen and source of lung disease. It is doubtful that these occurrences will be developed in the near future. It is important to remember them in planning in order to mitigate their potentially harmful effects, e.g., building a road or a reservoir over a deposit might not be advisable.

Asbestos; MILS #117

Amphibole asbestos forms fibers up to one foot long. The zone was reportedly "extensive" (Murdock and Webb, 1956) but no known exploration or development has taken place there.

Asbestos: MILS #131

Location doubtful. Murdock and Webb, 1956, mention slip-fiber asbestos southeast of Pinyon Flat in Secs. 4, 5; T. & S., R. 6 E., SBM. These Sections are southeast of Pinyon Flat.

Chaleboix Asbestos; MILS #139a

Slip-fiber amphibole asbestos is exposed in veins up to 2 feet thick. Narrow, irregular veins occur in the mylonite zone. A series of tunnels were driven in the floor of an open cut. Murdock and Webb report that 800 tons of asbestos were mined in 1930. Lockwood (1961) reports stockpiles of rock near the quarries. This deposit and the following one are outside the SRHMA but asbestos probably occurs in the same zone inside the area.

Dunn; MILS #139b

Shallow shafts and open cuts expose amphibole slip-fiber asbestos up to 1 foot wide. A fualt running through this deposit and the Chaleboix deposit apparently carries irregular veinlets of asbestos throuhout its known length. Lockwood (1961) suggests that these occurrences might be reopened if "economic machinery for asbestos recovery could be set up.

Corundum

Agua Caliente; MILS #165

The occurrence is unconfirmed.

Limestone-Dolomite

"Calcium" is a component of these deposits, however, their primary importance would be as sources of limestone, dolomite, and/or

marble for decorative stone, or crushed rock for road gravel or roofing granules. Their usefullness would depend on the purity of the rock.

Dolomite Mine; MILS 127a

Metamorphased limestone of the Palm Springs metasediments was quarried in Sec. 11, T. 7 S., R. 5 E., SBM. Over 25,000 tons were removed by 1961 (Lockwood). The mine is outside the SRHMA but the geologic unit extends into the study area. Exploration and development of this unit is highly possible.

Palm Springs Canyon; MILS #158
Cameron Marble Co.; MILS #166

No information is known about the exploration and history of these deposits. They are in a limestone unit of the sedimentary rocks.

Silica and Feldspar

These materials may be used as crushed rock and for other industrial purposes depending on the purity of the feldspar and silica.

Dunn Deposit; MILS #132

The occurrence is shown on the map accompanying Tucker and Sampson but it is not described the text of the report. Nothing is known about the extent of the deposit, or possible production. The occurrence is outside the SRHMA boundaries but the geologic unit in which it is found extends into the study area. Further exploration of the deposit is highly possible.

Sand and Gravel

Sand, gravel and aggregate are important construction materials. Continued growth of the towns in the Coachella Valley will make these deposits more attractive and important to developers. It will be difficult to disallow development of sand and gravel in this area due to this past use, which has set a precedent, growing economic importance, and easy accessibility.

II. Potential Mineral Occurrences

Two studies of mineral potential were made for the Desert Plan Staff. They are remote sensing/research studies by General Electric and by Terradata.

Lineament Study-General Electric (GE)

Using remote sensing techniques and previously published data, GE gave a score to every cell of an arbitrary 10 Km X 10 Km grid covering the California Desert Conservation Area. The Desert Plan geologist used statistical manipulation to help predict mineral potential. Correlations of Lineanent Study criteria are shown on the geological resource map. Correlation of favorable lithnology and mineral occurrence criteria is the most important area indicated by this study.

Geostatistical Terradata

Information on mineral occurrences from the Geostatistical Study is similar to locations in Smith et al. No new occurrences, i.e., not shown by Smith et al. were indicated by this study. Mineral potential was determined by DPS from this study by enclosing areas around known occurrences with similar geologic setting.

III. Potential Vertebrate Paleontology

A contract study by M.O. Woodburn for the Desert Plan Staff identifed areas where vertebrate fossils are likely to be found. The areas, labelled V_1 on the geological resources map, have a low probability of finding vertebrate fossil sites, however, during any excavation a trained observer should be present. Areas labelled V_2 are geologically similar to V_1 but were not indicated by the study. All prospective sites, V_1 and V_2, occur in Pleistocene nonmarine sediments. This may cause conflicts with sand and gravel excavations.

MAP #9

SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

T4S

T5S

T6S

T7S

T8S

R4E

R5E

R6E

R7E

R8E

- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- 1 RECENT DUNE SAND AND ALLUVIUM
- 2 PLEISTOCENE MARINE AND NON-MARINE SEDIMENTARY ROCKS
- 3 PLIOCENE NON-MARINE SEDIMENTARY ROCKS
- 4 CENOZOIC NON-MARINE SEDIMENTARY ROCKS
- 5 PRE-CRETACEOUS METASEDIMENTARY ROCKS
- 5a PRE-CRETACEOUS LIMESTONE OR DOLOMITE
- 6 MESOZOIC GRANITIC ROCKS
- 7 MESOZOIC BASIC AND ULTRA-BASIC INTRUSIVE ROCKS
- 8 PRE-CENOZOIC GRANITIC AND METAMORPHIC ROCKS
- FAULTS (a); THRUST FAULTS (b)

KILOMETERS 1.5 0 1 2 3 4

MILES 1.5 0 1 2 3 4

GEOLOGY

MAP #10

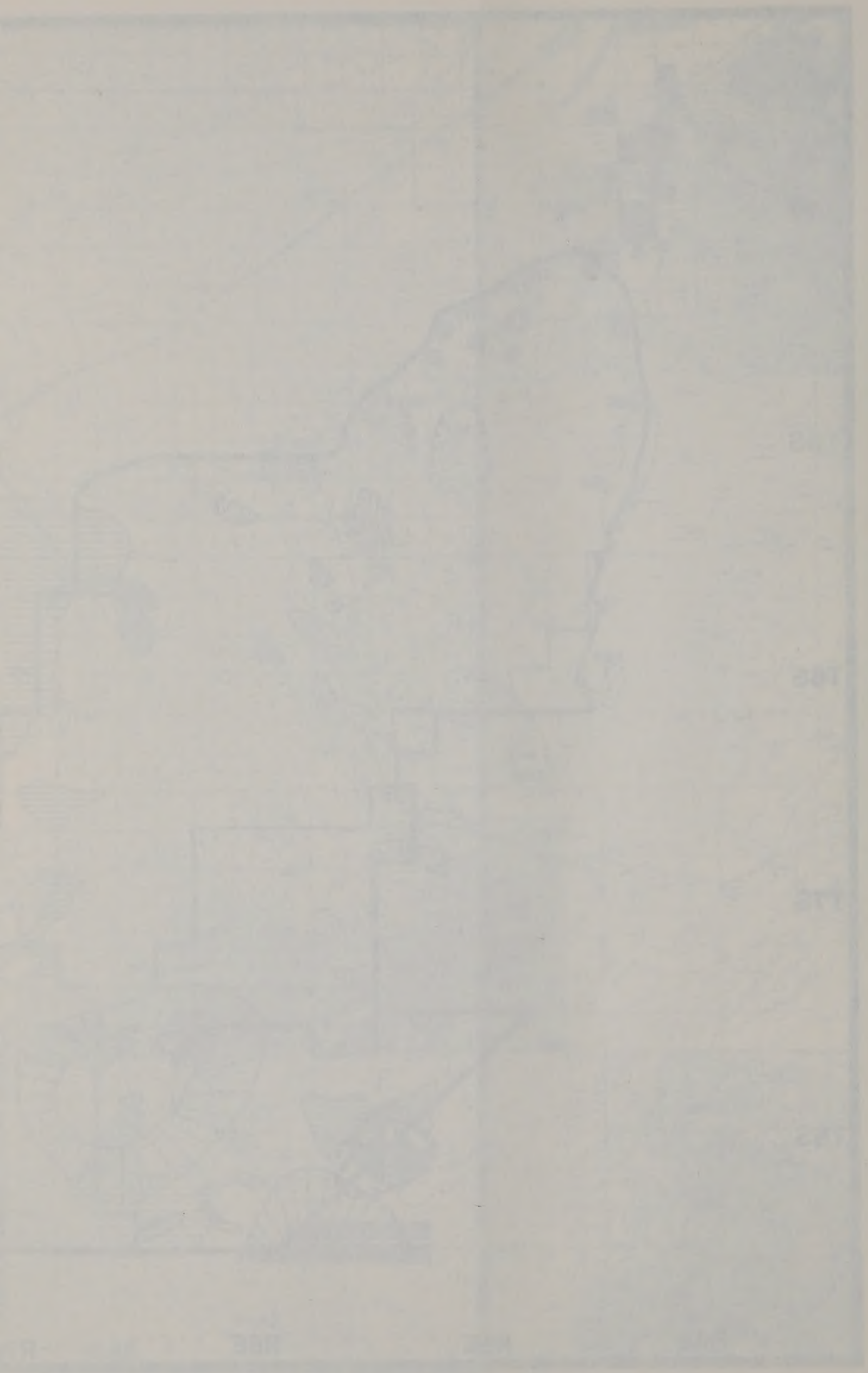
SANTA ROSA WILDLIFE HABITAT MANAGEMENT PLAN

- BOUNDARY OF SANTA ROSA WILDLIFE HABITAT AREA
- BOUNDARY OF SAN BERNARDINO NATIONAL FOREST
- MINERAL POTENTIAL (BASED ON G.E. LINEAMENT STUDY)
- MINERAL OCCURRENCES DESCRIBED IN TEXT
- MINERAL POTENTIAL BASED AROUND KNOWN OCCURRENCES
- MINERAL POTENTIAL (BASED ON TERRADATA STUDY)
- POTENTIAL VERTEBRATE FOSSIL SITES (WOODBURNE STUDY)
- SIMILAR GEOLOGIC ENVIRONMENT TO ABOVE WOODBURN STUDY AREAS

T4S
T5S
T6S
T7S
T8S
R4E
R5E
R6E
R7E
R8E

KILOMETERS 1 .5 0 1 2 3 4
MILES 1 .5 0 1 2 3 4

GEOLOGICAL RESOURCES



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